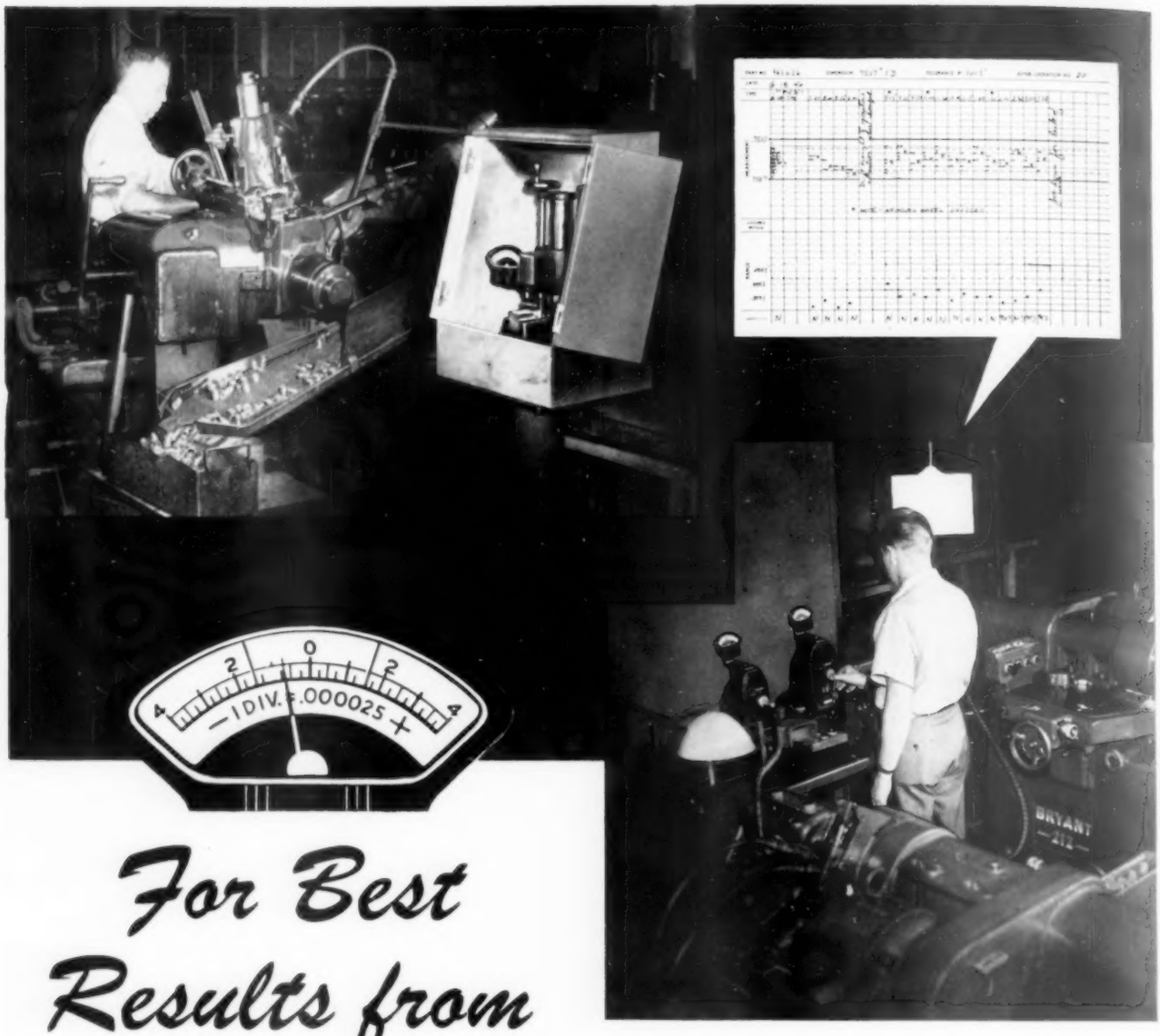
THE TOOL ENGINEER

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

Behind every product that is mass produced is the tool engineer



For Best Results from

STATISTICAL QUALITY CONTROL

Interchangeability of parts is fundamental to today's production. One of the modern ways to maintain interchangeability is by statistical quality control methods that visualize the working control limits within which variations are allowed to deviate from the standard.

Effective statistical quality control requires gages possessing characteristics of *high-sensitivity, readability, accuracy, stability* and *gaging speed.* P&W Electrolimit Comparators — both external and internal — meet these requirements.

P&W Comparators are extremely sensitive instruments, yet heavily constructed to withstand constant shop use.

They are a proved investment in production plants because they help to *reduce manufacturing costs, improve quality* and *increase production.*

Write on your company letterhead for further information and the assistance of our engineers in establishing or improving statistical quality control in your plant.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

PUBLISHED MONTHLY BY

THE TOOL ENGINEER

AMERICAN SOCIETY OF TOOL ENGINEERS

Volume XVII | September, 1946 | Number 2

Editorial

Robert B. Powers . . . . . *Executive Editor*
A. E. Rylander . . . . . *Technical Editor*
Fred W. Steiner . . . . . *Editorial Associate*
Doris B. Pratt . . . . *A.S.T.E. News Editor*
Nik Varkula . . . . . *Technical Art Director*

Advertising

Jay L. Hammen . . . . . *Business Mgr.*
Clarence T. Etter . . . . . *Advertising Mgr.*

Editorial Committee

W. B. McClellan . . . . . *Chairman*
K. C. Jasper — Foster C. Koehn
Michael J. Radecki — H. L. Tigges

Officers

A. M. Sargent . . . . . *President*
W. B. Peirce . . . . . *First Vice-President*
T. P. Orchard . . . . . *Second Vice-President*
I. F. Holland . . . . . *Third Vice-President*
R. B. Douglas . . . . . *Secretary*
V. H. Ericson . . . . . *Treasurer*
W. A. Dawson . *Assistant Secretary-Treasurer*
H. E. Conrad . . . . . *Executive Secretary*

Board of Directors

A. M. Sargent, *Chairman*

Edward J. Berry — Hallet D. Jones
C. V. Briner — John A. Lapham
D. D. Burnside — Frank Martindell
Frank W. Curtis — H. D. Mozeen
W. A. Dawson — Thomas P. Orchard
Arthur J. Denis — W. B. Peirce
Robert B. Douglas — L. J. Radermacher
W. C. Fields — A. M. Schmit
W. J. Frederick — Ernest M. Seifert
William J. Gamble — Hayden R. Shearer
H. E. Goodfellow — Howard Volz
Kenneth C. Jasper — William W. Young

TABLE OF CONTENTS

		Page
Editorial—Effort Plus Skill Equals Luxuries	*by A. M. Sargent*	17
Tool Engineering and Profits—A Symposium		18
Introduction	*by Ralph E. Flanders*	
Profit Producers for Industry	*by A. G. Bryant*	
Relationship of Tool Engineering to Profits	*by Clifford E. Ives*	
Exploring Carbide Possibilities in Single Point Turning	*by J. F. Allen*	27
Mechanical Variable Speed Transmissions	*by Lev A. Trofimov*	36
From Oil Well to Tires in Six Days	*by Fred M. Burt*	41
Donate Surplus Machine Tools to Schools	*by Frank D. Sanborn*	47
Man-Au-Trol Spacer Insures Accurate Duplication	*by A. E. Rylander*	71

DEPARTMENTS

A.S.T.E. News	
"More and Better Goods for Modern Living," Theme of A.S.T.E. Pittsburgh Convention, October 10-12	49
Andygrams	65
Gadgets	66
Fundamentals of Tool Engineering	67
Good Reading	69
Bulletins and Trade Literature	70
Tools of Today	72
North, East, West, South in Industry	78
Index to advertisers	158

American Society of Tool Engineers

National Headquarters

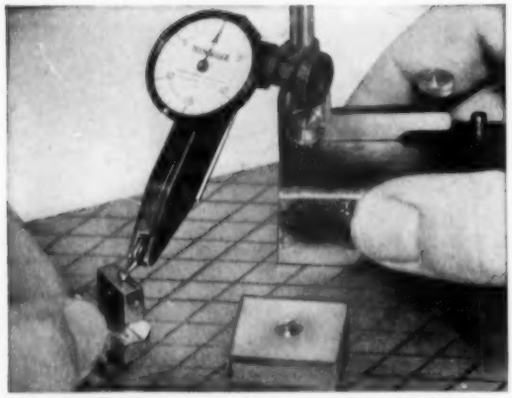
1666 Penobscot Bldg. — Detroit 26, Michigan

The TOOL ENGINEER
Editorial and Advertising Offices:
1922 West Canfield — Detroit 8, Michigan

The Tool Engineer is published monthly at 1666 Penobscot Building, Detroit 26, Michigan, in the interest of the members of the American Society of Tool Engineers. Advertising and Editorial departments are located at 1922 West Canfield, Detroit 8, Michigan. Subscription is $2.00 per year. Non-members $6.00 per year in the U.S.A., Canada $6.50 per year; all other foreign countries, $8.00 per year. Copyright 1946 by the American Society of Tool Engineers. Entered as second-class matter February 8, 1945, at the post office at Detroit, Michigan, under the Act of March, 1879.

ONLY TESTMASTER OFFERS YOU

TWO STYLES



REGULAR STYLE checking heights using a surface gage.

PERPENDICULAR STYLE gives fully visible readings "around the clock" on Jig Borers, etc.

Choose The Style You Need . . .

The positive accuracy of the Regular Style Testmaster has already made it the favorite wherever precise work is required. Equally accurate and compact is the new Perpendicular Style Testmaster. Because of the new dial location, this Indicator provides easier reading, more convenient positioning and faster handling of work on Jig Borers, Drill Presses and many other machine shop operations. Both styles are ruggedly built. The direction of point travel is reversible. The Index Point clicks to any position in a 180° arc, and when in position it *stays* there — with no looseness whatsoever. Either style brings you efficient, accurate, long-lasting service . . . at a very low price.

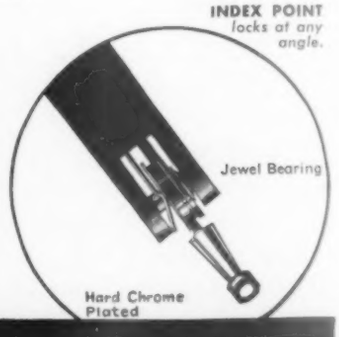
Choose The Model You Need . . .

Regular	Perpendicular	Graduated	Range	Price with case and Holding Device
Model 1	Model 5	.001″	.030″	$20.50
Model 2	Model 6	.0001″	.008″	$25.00
Model 3	Model 7	.0025mm	.2mm	$25.00
Model 4	Model 8	.01mm	.8mm	$20.50

Write for more detailed information today.

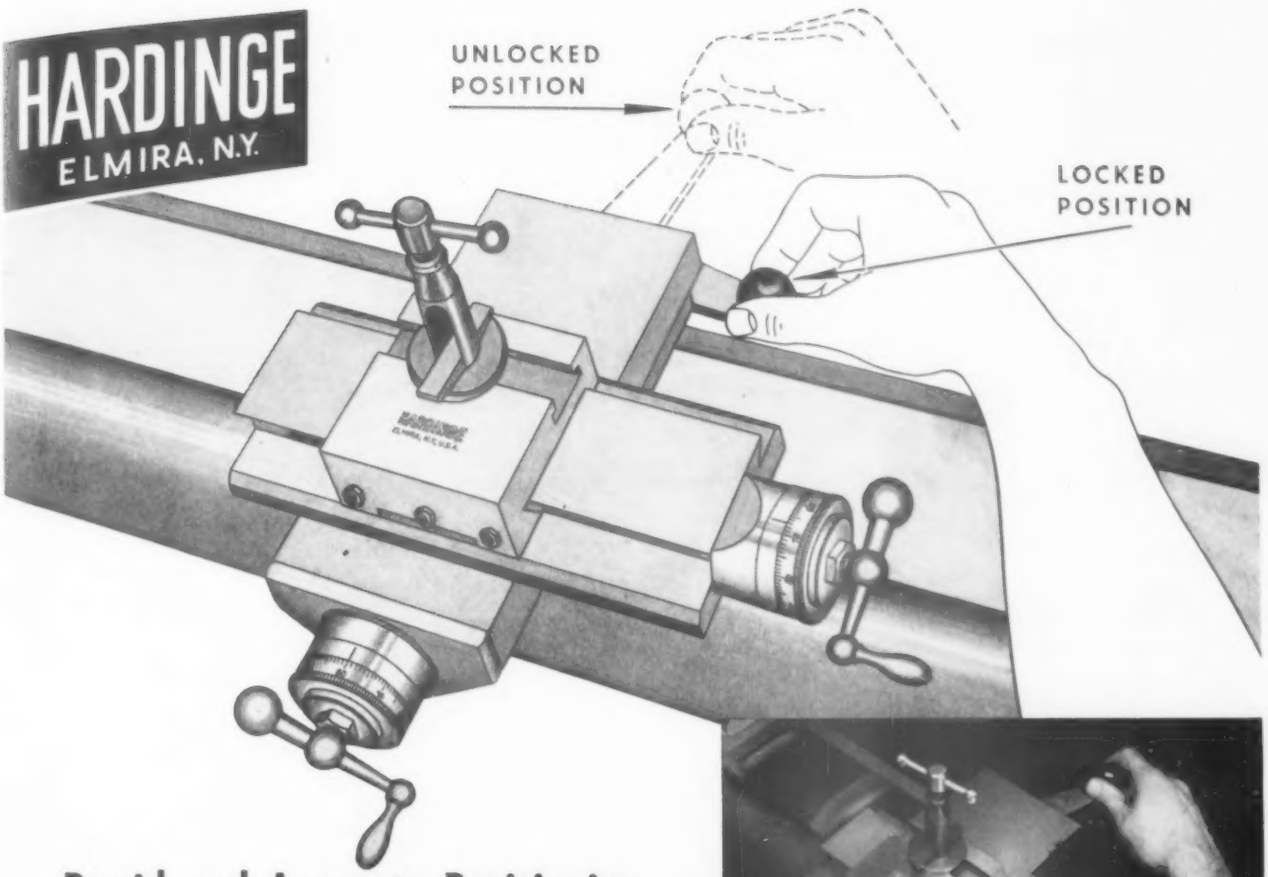
FEDERAL PRODUCTS CORPORATION
1144 EDDY ST., PROVIDENCE 1, R. I.

CHICAGO • CLEVELAND • DALLAS
DENVER • DETROIT • FORT WORTH
GREENSBORO • HARTFORD • HOUSTON
INDIANAPOLIS • LOS ANGELES • MEMPHIS • MILWAUKEE • MINNEAPOLIS
NEW YORK • PHILADELPHIA • PITTSBURGH • PORTLAND • ROCHESTER • SAN FRANCISCO • SEATTLE • ST. LOUIS
TULSA • WINDSOR • MONTREAL
TORONTO • VANCOUVER



FEDERAL MECHANICAL AIR and ELECTRONIC GAGES
PRECISION MEASURING INSTRUMENTS

HARDINGE
ELMIRA, N.Y.

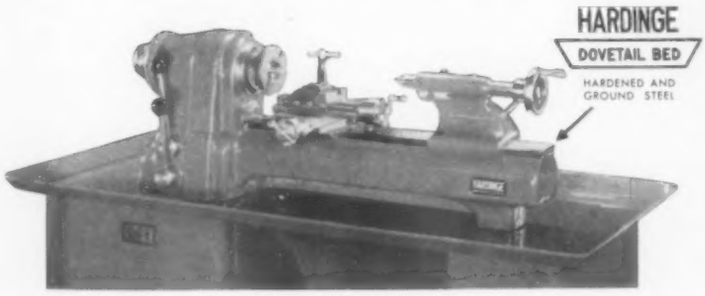


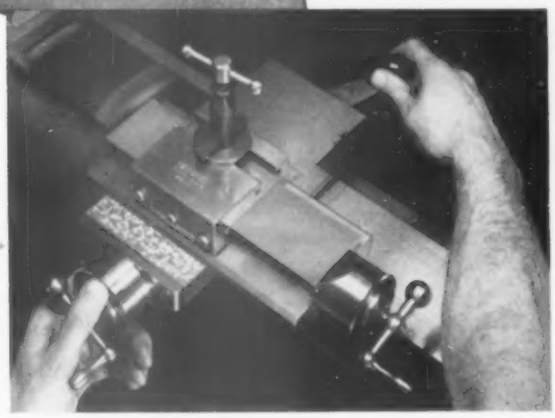
Rapid and Accurate Positioning with HARDINGE Compound Slide Rest

This compound slide rest obsoletes all other compound slide rests due to speed and accuracy of operation. It can be applied or removed from the HARDINGE Dovetail Bed in five seconds or less, making it the fastest positioning compound slide rest known. Also, when removed from the dovetail bed and reapplied, it will repeat previous index slide settings in relation to the spindle centerline. This cannot be said for ordinary compound slide rests.

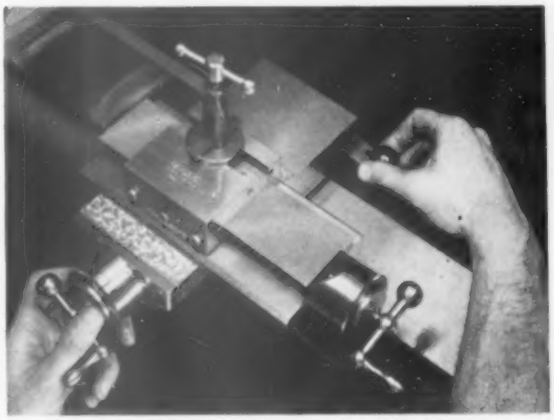
OTHER FEATURES: Hardened and ground steel index slide section; large hardened feed screws mounted on preloaded ball bearings; easy-to-read 2″ diameter feed screw dials; index slide swivels 360° and has two independent locks; solid bottom slide does not have a weakening T-slot for conventional bed bolts.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.





In the unlocked position, the quick-acting lock is released, permitting the Hardinge Compound Slide Rest to be moved along the bed ways or lifted from the machine.



The Hardinge Compound Slide Rest is rapidly and accurately locked in any desired position on the bed ways by a simple 90° movement of the lever.

Directory of A.S.T.E. Chapter Chairmen

AKRON CHAPTER, NO. 47
Second Thursday *
Clyde B. Mitchella, *Chairman*
1396 Hadden Circle.
Akron 2, Ohio

ATLANTA CHAPTER, NO. 61
First Wednesday *
James C. Cogburn, Jr., *Chairman*
3311 Mathieson Dr., N.E.,
Atlanta, Ga.

BALTIMORE CHAPTER, NO. 13
First Wednesday *
W. Daryl Winger, *Chairman*
607 Baltimore Ave.,
Towson 4, Md.

BINGHAMTON CHAPTER, NO. 35
1st Wed. after 1st Mon.*
William S. Mazar, *Chairman*
P.O. Box 71, Chenango
Bridge, N. Y.

BOSTON CHAPTER, NO. 33
Second Thursday *
J. B. Savits, *Chairman*
28 Arnold Road, No. Quincy
71, Mass.

BUFFALO-NIAGARA FRONTIER CHAPTER, NO. 10
Second Wednesday*
Martin W. Kotarba, *Chairman*
1420 Byrd Ave., Niagara
Falls, N. Y.

CEDAR RAPIDS CHAPTER, NO. 71
Third Wednesday *
Michael J. Fitzgerald, *Chairman*
123 36th St. Drive, S.E.,
Cedar Rapids, Iowa

CENTRAL PENNSYLVANIA CHAPTER, NO. 22
Second Tuesday *
Walter G. Vernon, *Chairman*
401 W. Hillcrest Rd., Hillcrest,
York, Penna.

CHICAGO CHAPTER, NO. 5
First Monday *
Clare Bryan, *Chairman*
Link-Belt Co., 307 N. Michigan
Ave., Chicago 1, Ill.

CINCINNATI CHAPTER, NO. 21
Second Tuesday *
Lorin Hayden, *Chairman*
Modern Tool Co., 436 Commercial Square, Cincinnati, Ohio

CLEVELAND CHAPTER, NO. 3
Second Friday *
Rudolph E. Harrold, *Chairman*
Cleveland Duplex Machinery
Co., 626 Penton Bldg.,
Cleveland, Ohio

COLUMBUS CHAPTER, NO. 36
Second Wednesday *
Walter E. L. Bock, *Chairman*
323 Southwood Ave.,
Columbus 7, Ohio

DAYTON CHAPTER, NO. 18
Second Monday *
Adam Lensch, *Chairman*
29 Wroe Ave., Dayton 6, Ohio

DECATUR CHAPTER, NO. 58
Second Monday *
Cecil Elmer White, *Chairman*
1969 E. Clay St., Decatur 44,
Illinois

DETROIT CHAPTER, NO. 1
Second Thursday *
W. B. McClellan, *Chairman*
Gairing Tool Co., 478 Roosevelt
Sta., Detroit 32, Mich.

ELMIRA CHAPTER, NO. 24
First Monday *
Floyd B. Allen, *Chairman*
419 Balsam St., Elmira, N. Y.

ERIE CHAPTER, NO. 62
First Tuesday *
Harold W. Hagle, *Chairman*
3020 Woodlawn Ave.,
Wesleyville, Pa.

EVANSVILLE CHAPTER, NO. 73
Second Monday *
Howard C. McMillen, *Chairman*
Seeger-Sunbeam Corp.
Evansville 7, Ind.

FAIRFIELD COUNTY CHAPTER, NO. 6
First Wednesday *
Charles J. Gluck, *Chairman*
21 Spring, Shelton, Conn.

FLINT CHAPTER, NO. 68
Third Thursday *
L. A. Kitchen, *Chairman*
600 E. Moore St., Flint 5,
Mich.

FOND DU LAC CHAPTER, NO. 45
Second Friday *
Leonard J. Kaufman, *Chairman*
2305 Wollmer St., Manitowoc,
Wis.

FORT WAYNE CHAPTER, NO. 56
Second Wednesday *
John G. Astrom, *Chairman*
1006 W. Wildwood Ave.,
Fort Wayne 6, Ind.

FOX RIVER VALLEY, NO. 72
First Tuesday*
H. J. Braun, *Chairman*
611 5th St., Aurora, Ill.

GOLDEN GATE CHAPTER, NO. 28
Third Wednesday *
Edward John Raves, *Chairman*
2100 Santa Clara Ave.,
Alameda, Calif.

HAMILTON CHAPTER NO. 42
Second Friday *
John Neil Walton, *Chairman*
195 Main St. E.,
Hamilton, Ont.

HARTFORD CHAPTER, NO. 7
First Monday *
Edmond Morancey, *Chairman*
37 Kensington St.,
Manchester, Conn.

HOUSTON CHAPTER, NO. 29
Second Tuesday *
John C. Preston, *Chairman*
3113 No. Shepherd Drive,
Houston 8, Texas

INDIANAPOLIS CHAPTER, NO. 37
First Thursday *
David R. Smith, *Chairman*
2208 Park Ave. No. 2,
Indianapolis 5, Ind.

KANSAS CITY CHAPTER, NO. 57
First Wednesday *
Amber N. Brunson, *Chairman*
Brunson Instrument Co., 1405
Walnut, Kansas City 6, Mo.

LITTLE RHODY CHAPTER, NO. 53
Third Wednesday *
Arnold Chester White, *Chairman*
180 Morse Ave., Greenwood,
R. I.

LOS ANGELES CHAPTER, NO. 27
Second Thursday *
Anton Peck, *Chairman*
801 West 109th St.
Los Angeles 44, Calif.

LOUISVILLE CHAPTER, NO. 54
Second Tuesday *
Ancil C. Brown, *Chairman*
1823 Alfresco Place.,
Louisville 5, Ky.

MILWAUKEE CHAPTER, NO. 4
Second Thursday *
Richard H. Ford, *Chairman*
R.D. 3, Box 525, Waukesha,
Wis.

MONTREAL CHAPTER, NO. 50
Second Wednesday *
W. F. Stewart, *Chairman*
4855 Harvard Ave., N. D. G.
Montreal, Quebec

MUNCIE CHAPTER, NO. 70
Second Wednesday *
William H. Vickers, *Chairman*
324 N. McKinley Ave.,
Muncie, Indiana

NASHVILLE CHAPTER, NO. 43
Third Friday *
Charles R. Oliver, *Chairman*
525 Heather Place,
Nashville, Tennessee

NEW HAVEN CHAPTER, NO. 41
Second Thursday *
Frank A. Shute, *Chairman*
Birchwood Drive, Orange, Conn.

NEW ORLEANS CHAPTER, NO. 60
Second Tuesday *
Edwin E. Graf, *Chairman*
6240 Pasteur Blvd.,
New Orleans 19, La.

NEW YORK, GREATER, CHAPTER, NO. 34
First Monday *
H. L. Horton, *Chairman*
Industrial Press, 148 Lafayette
St., New York 13, N. Y.

NIAGARA DISTRICT CHAPTER, NO. 65
Third Friday *
Evander G. Dewar, *Chairman*
130 George St.,
St. Catharines, Ont.

NORTH TEXAS CHAPTER, NO. 51
Last Friday *
Fred Bates, Jr., *Chairman*
4125 Locke, Ft. Worth 7,
Texas

NORTHERN NEW JERSEY CHAPTER, NO. 14
Second Tuesday *
John L. Webster, *Chairman*
964 Darien Terrace,
Teaneck, N. J.

PEORIA CHAPTER, NO. 31
First Tuesday *
C. B. Hartsock, *Chairman*
135 Cooper, Peoria 5, Ill.

PHILADELPHIA CHAPTER, NO. 15
Third Thursday *
Howard W. Gross, *Chairman*
Spring Garden Institute,
Broad & Spring Garden Sts.,
Philadelphia 23, Pa.

PHOENIX CHAPTER, NO. 67
Last Wednesday*
Harry E. Rives, *Chairman*
R.D. No. 1, Box 1187,
Phoenix, Ariz.

PITTSBURGH CHAPTER, NO. 8
First Friday *
William H. Schott, *Chairman*
1517 Graham Blvd.,
Pittsburgh 21, Penna.

PONTIAC CHAPTER, NO. 69
Third Thursday *
George F. Bryan, *Chairman*
73 N. Anderson St.,
Fontiac 20, Mich.

PORTLAND (MAINE) CHAPTER, NO. 46
Fourth Friday *
Merton C. Corson, *Chairman*
65 Evans St.,
South Portland 7, Maine

PORTLAND (OREGON) CHAPTER, NO. 63
Third Thursday *
Gerald E. Healy, *Chairman*
4002 N.E. 28th Ave.,
Portland 12, Ore.

POTOMAC CHAPTER, NO. 48
First Thursday *
Robert T. Plitt, *Chairman*
6110 39th Place,
Hyattsville, Md.

RACINE CHAPTER, NO. 2
First Monday *
Alfred P. Nelson, *Chairman*
3209 Victory Ave., Racine, Wis.

RICHMOND CHAPTER, NO. 66
Second Tuesday *
Jesse W. Johnson, *Chairman*
324 South Eight St.,
Richmond, Ind.

ROCHESTER CHAPTER, NO. 16
Second Wednesday *
Charles E. Seely, *Chairman*
2 Lake Crest Dr.,
East Rochester, N. Y.

ROCKFORD CHAPTER, NO. 12
First Thursday *
D. E. Hawkinson, *Chairman*
Greenlee Bros. & Co.,
12th St. & Columbia Ave.,
Rockford, Ill.

ST. LOUIS CHAPTER, NO. 17
First Thursday *
Jacob J. Demuth, *Chairman*
8007 Allen Ave.,
St. Louis Co. 14, Mo.

SAN DIEGO CHAPTER, NO. 44
Second Tuesday *
Paul H. Whitmoyer, *Chairman*
8864 Jefferson Ave.,
La Mesa, Calif.

SCHENECTADY CHAPTER, NO. 20
Second Thursday *
Delbert M. Schiele, *Chairman*
General Electric Co.
1 River Rd.,
Schenectady 5, N. Y.

SEATTLE CHAPTER, NO. 39
Second Tuesday *
Kenneth Bergerson, *Chairman*
5018 6th N.E.
Seattle 5, Wash.

SOUTH BEND CHAPTER, NO. 30
Second Tuesday *
Carl C. Stevason, *Chairman*
1760 Kessler Blvd.,
South Bend 16, Ind.

SPRINGFIELD (ILLINOIS) CHAPTER NO. 64
First Tuesday *
Harry H. Washbond, *Chairman*
Baker Mfg. Co., 2316 S. 10th
St., Springfield, Ill.

SPRINGFIELD (MASS.) CHAPTER, NO. 32
Second Monday*
Charles H. Stonerod, *Chairman*
55 Field Road,
Longmeadow, Mass.

SYRACUSE CHAPTER, NO. 19
1st Tues. after 2nd Monday *
Raymond D. Coseo, *Chairman*
Crouse Hinds Co., Wolf at 7th,
No., Syracuse, N. Y.

TOLEDO CHAPTER, NO. 9
Second Wednesday *
Richard M. Hindman, *Chairman*
Doehler Jarvis Co., 2100
Smead Ave., Toledo, Ohio

TORONTO CHAPTER, NO. 26
Second Monday *
Walter W. Appleton, *Chairman*
56 Jackson Ave.,
Kingsway Park, Toronto, Ont.

TRI CITIES CHAPTER, NO. 23
First Monday *
Edwin A. Titus, *Chairman*
2221 Belle Ave.,
Davenport, Iowa

TWIN CITIES CHAPTER, NO. 11
Second Wednesday *
John A. Harrington, *Chairman*
4920 Arden Ave.
Minneapolis 10, Minn.

TWIN STATES CHAPTER, NO. 40
Second Wednesday *
William E. Farrell, *Chairman*
2 Pine St., Windsor, Vt.

WESTERN MICHIGAN CHAPTER, NO. 38
Second Monday *
James B. Brierley, *Chairman*
1525 Breton Rd., S.E.,
Grand Rapids, Mich.

WICHITA CHAPTER, NO. 52
Second Wednesday *
Roy W. Osburn, *Chairman*
1037 Marys Drive,
Wichita 12, Kansas

WILLIAMSPORT CHAPTER, NO. 49
Second Monday *
Jesse L. Strasburg, *Chairman*
715 Market St., So.,
Williamsport 32, Pa.

WINDSOR CHAPTER, NO. 55
Second Monday *
W. Bruce Moore, *Chairman*
46 Thompson Blvd.,
Riverside, Ont.

WORCESTER CHAPTER, NO. 25
First Tuesday *
Albert Thomas Warman, *Chairm'n*
130 Whitmarsh Ave.,
Worcester 6, Mass.

* CHAPTER MEETING NIGHT

FOR DEPENDABILITY

STANDARD *Dial Indicators*

REGULAR SERIES *Plus* *Decimatic** SERIES

AGD SPECIFICATIONS
THROUGHOUT

Made in 42 Models including 4 Dial Diameters, 7 Different Graduations, 90° Models (stem perpendicular to back), Long Range and Long Stem Types.

*Patents Pending

For Especially Fine Checking
EXTRA HIGH REPEATABILITY
MARKED IN DECIMALS
NO WHIP, NO WAVER OF HAND
AGD MOUNTING DIMENSIONS

Made in 19 Models including 4 Dial Diameters and 8 Different Graduations.

STANDARD SHOCKPROOF MECHANISM

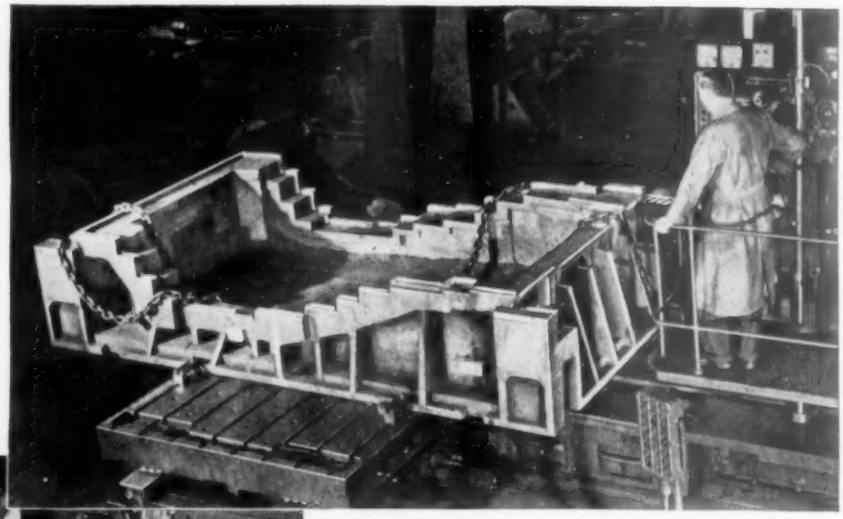
Used in practically all models. Guards the instrument against sudden application of the work piece; assures long life and continuing accuracy. It is a **fully** shockproof mechanism which protects all delicate parts from stem to indicating hand.

Write for Special Bulletin

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

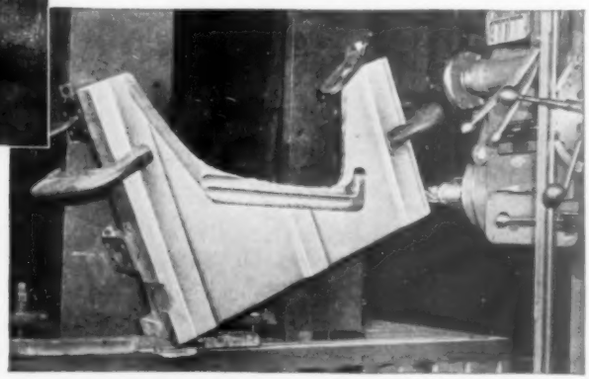
G. & L. MACHINE *Saves over* 40 *hours*

AUTOMOBILE ROOF TRIM DIE

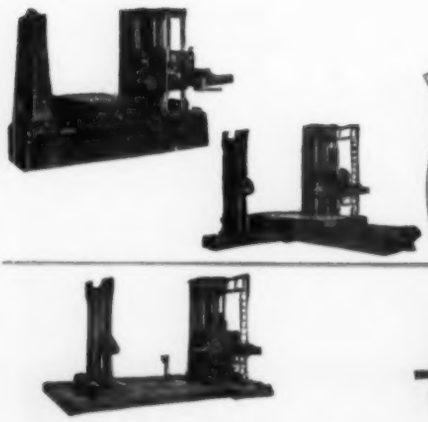


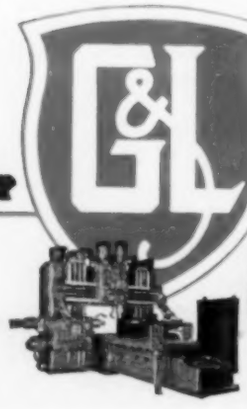
This 9-ton roof top trim die is readily machined on a 570-T Table Type Giddings & Lewis Horizontal Boring Drilling and Milling Machine.

Contour milling of a segmental automotive window die



Simple angle plates hold this window die in position for machining. Set-ups like this mean worthwhile savings in over-all machining.





Giddings

IN MULTIPLE OPERATIONS ON HUGE

• • • Smaller G. & L. Profitably Mills Contours on Window Re-enforcement Forming Dies — And Machines Similar Other Die Segments Faster and Easier.

One of Detroit's largest producers of automotive body dies cuts machining time more than 40 hours on a 9 *ton* roof top trim die by using a G. & L. horizontal boring machine. Performing the same operations on another machine required additional layout work, added set-ups and more actual machine time.

Now the steps on both sides of the die, the ends and side pads are milled in a floor-to-floor time of approximately 70 hours. The large table type Giddings & Lewis horizontal boring, drilling and milling machine has ample capacity to handle this huge casting. There are no interfering supports or columns to complicate the work set-up. An overhead crane readily positions the die on the machine table, where it is possible to perform machining operations easier, faster and more accurately.

Increasing Production of Segmental Type Dies

Just as the large G. & L. machine, through its open construction, simplifies work set-up and speeds the machining of unusually big parts, the small versatile, highly flexible Giddings & Lewis horizontal boring machine quickens the output of segmental type dies.

Two photographs show how a window re-enforcement forming die is mounted on angle plates and machined. Irregular shaped die components such as this part are contour milled, bored, drilled and faced without difficulty. On this window die only five simple set-ups were required to mill the insert recess, machine the ends and heel surfaces and bore a single one-inch hole. Versatility and flexibility of the G. & L. machine are obtained through longitudinal saddle movement, lateral table movement, vertical headstock movement and spindle traverse.

Experienced Giddings & Lewis engineers will gladly discuss your die making problems and show you how to make exceptional savings by using G. & L. equipment. Do not hesitate to submit your machining problems for their consideration. There is no obligation for this help.

Profitable
PRODUCTION FACTS— covering interesting field cases show how Giddings & Lewis machines and attachments will increase work output. Write for this *FREE* information now. Ask for Bulletin TE132

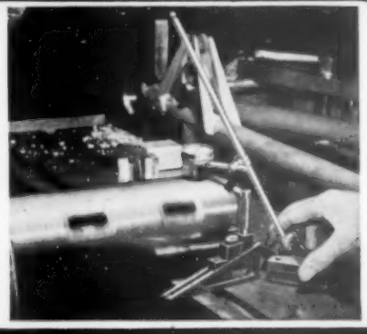
G & Lewis MACHINE TOOL CO.

132 DOTY STREET • FOND DU LAC, WISCONSIN

STARRETT DIAL INDICATORS

STARRETT DIAL TEST INDICATORS

ARE MADE TO MEASURE FOR EVERY



MACHINE, JIG, FIXTURE OR BENCH

INDICATING OR INSPECTION OPERATION

Sturdy, easy-to-read, accurate Starrett Dial Indicators are adapted to a thousand uses. New Starrett Dial Indicator Catalog "E" shows a complete choice of models to suit your needs. May we mail a copy?

THE L. S. STARRETT CO. · ATHOL, · MASSACHUSETTS · U.S.A.

World's Greatest Toolmakers

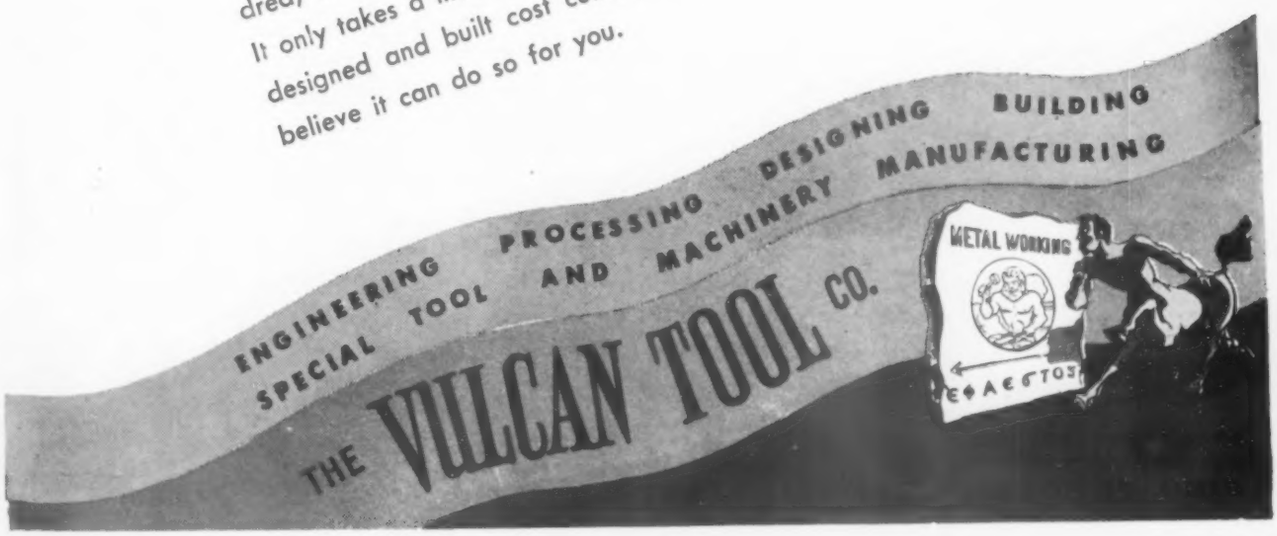
STARRETT

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • HACKSAWS
METAL AND WOOD CUTTING BAND SAWS • GROUND FLAT STOCK

CROWNS STILL WEAR LIONS BUT LIONS WEAR CROWNS NO MORE

Hunted man now hunts the lion with tools. With tools man makes his voice heard a thousand times as far as the lion's. With tools General Marshall jumped from Chungking to America—a leap a million times as far as any lion ever sprang.

Tomorrow the crown in your industry will be worn by the firm that is now acquiring better special tools, and multiplying by ten, or a hundred, or a thousand times the work that one man has been doing. It only takes a little time and a little faith to consult a firm that has designed and built cost cutting special tools for others and dares believe it can do so for you.



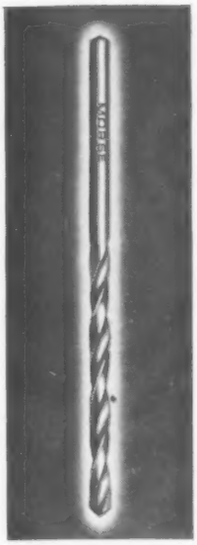
. . . then let MORSE recommend the One Drill that will *Live Longest on Your job*

MORSE recommendations for cutting tools have back of them a long and successful experience. Which means a broad and exact knowledge of what type, metal, diameter, length and twist-cut has been proven—out of Morse experience—to work best.

All specifications necessary to economical drilling may not occur to the user, when ordering. But when you put your problems up to Morse, all those factors are taken into consideration. Morse recommendations give you top drill performance per dollar. If you have drill troubles, run your eye over these Morse Special Purpose Drills . . . and then let Morse help you to decide on a drill (shown here, or not) that will do the best job for *you*. Your Industrial Supply Distributor will co-operate.

MORSE **Quick-Twist Drills** (1363) . . . for deep-hole drilling in aluminum, magnesium, die-cast metals; for slate, marble and certain plastics.

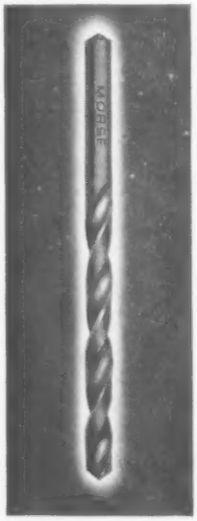
MORSE **Tungsten-Carbide-Tipped Drills for Non-Ferrous Metals** . . . and for abrasive materials, soft and chilled cast-iron, asbestos, mica compounds, plastics.



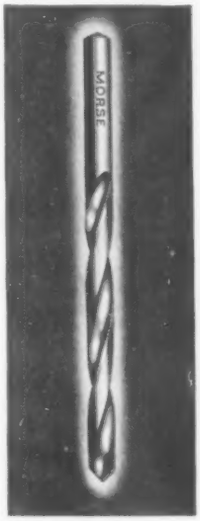
MORSE **Cotter-Pin Drills (1386)** . . . for skin metal, shallow-hole drilling, cotter-pin holes, steering arms, knuckles, gas burners and copper. Ideal in portable drills.

MORSE **Brass Drills (1344)** Specially designed for work in brass. Made with wide grooves to clear chips easily Special slow spiral.

MORSE **Heavy-Duty Drills (1365)** for stainless steels, spring steels, hard cast iron, monel and hard-to-work materials.



MORSE **Cobalt Drills (2330)** . . . for hard materials, can be run 25% faster. Used in rigid drill press with positive power drive capable of extreme point pressure.



MORSE **Bakelite Drills (1361)** . . . for Bakelite, Ebonite, asbestos, fibre, brass, hard rubber, various molded plastics. Withstands abrasion.

MORSE **General-Purpose Drills (1330)** The general purpose drill used when special purpose drills are not required.

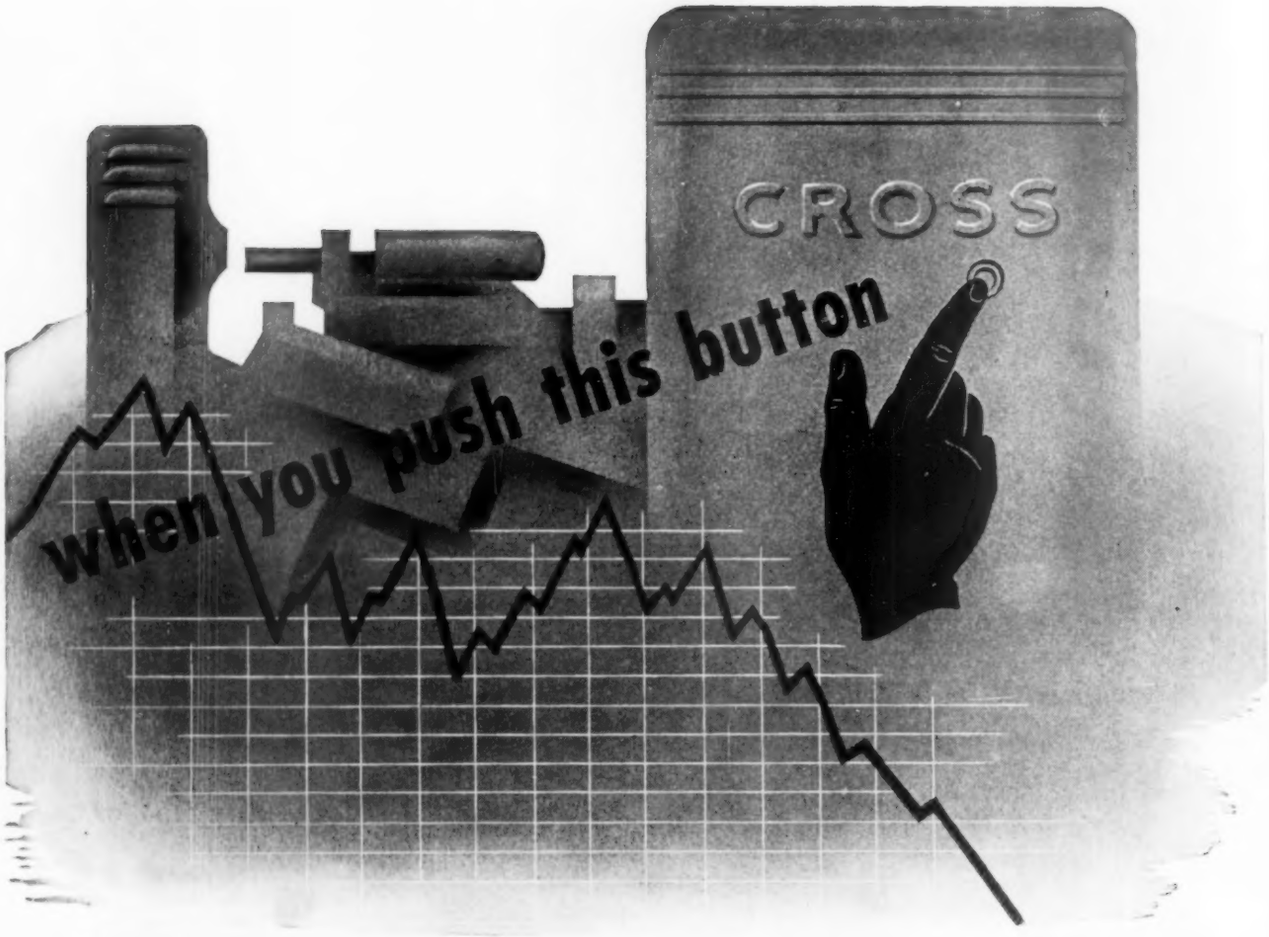
Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.



PRODUCTION COSTS GO DOWN...

The evolution of profitable mass production developed like this:

As you produce more efficiently, you lower your costs and continually tap new markets of mass buyers. But efficiency can go only so far—and direct labor has been and will continue to be a rising cost. It eats into your sales potential and shrinks your profits.

So your problem becomes that of making the individual workman more efficient—of producing not just more goods, but more goods per man-hour, with less effort and less fatigue per man.

On this principle of more production per man-hour, mass producers in the metal-working industries are meeting the problem. Many of them all over the world have met it by using Cross Special Machine Tools, specially designed to perform one or a series of metal-working operations automatically with semi-skilled operators or attendants.

Lowell Thomas tells the story of the mass production evolution in a new Cross motion picture, "Tools For Profit." The film runs 30 minutes, and prints are available now for group showings. Arrange a booking by writing, on your letterhead, to the Cross Company, Detroit 7, Michigan.

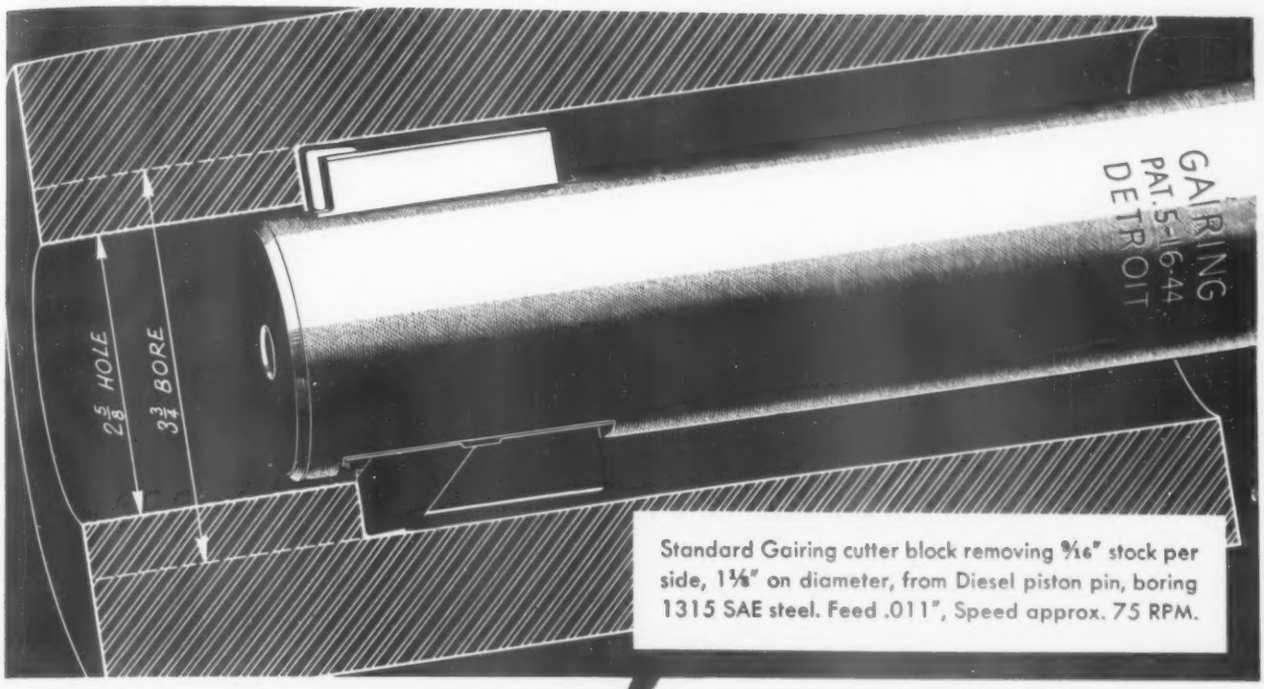
THE CROSS COMPANY

Established 1898

SPECIAL MACHINE TOOLS

MILLING · DRILLING · TAPPING · BORING · TURNING · SHAPING · GRINDING · HONING

DETROIT 7, MICHIGAN



Standard Gairing cutter block removing 9/16" stock per side, 1 1/8" on diameter, from Diesel piston pin, boring 1315 SAE steel. Feed .011", Speed approx. 75 RPM.

FOR *rough* BORING TOO—

Gairing's Block-Type Boring Tools Save Man Hours on Production Jobs

The sturdy Gairing boring bar, not weakened by the conventional centering hole, withstands the twisting strain of heavy cutting or fast removal of metal.

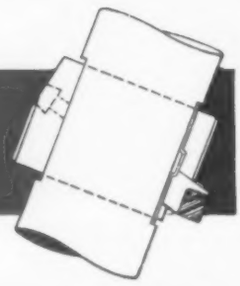
The standard block cutter, shown above, is but one of many instances where Gairing block-type boring tools demonstrated in actual production to be equally successful on roughing operations as on semi-finishing and finishing cuts.

And man hours are actually saved. Blocks are quickly and easily changed. They are pre-set to size, are always perfectly centered, eliminating the cut-and-try method of adjustment.

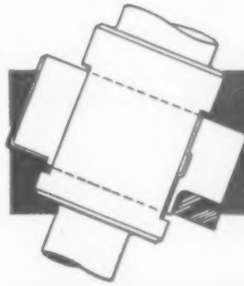
Standard and micrometer blocks are made in sizes ranging from 1¼ to 7¾". Larger sizes to order.

For full information request our complete Boring Tool catalog.

Standard Gairing cutter blocks can be furnished *regular type* for boring and *floating type* for finishing cuts.



Standard Gairing micrometer blocks have one blade, are quickly adjustable to within .001 in. diameter.



Special solid type blocks of high speed steel or tipped with hard alloy are designed for roughing or facing.

Special blocks are designed for multi-diameter work, combined boring, chamfering, counterboring, facing.

30th

GAIRING TOOLS

THE GAIRING TOOL COMPANY, Detroit 32, Michigan

IF YOU have THREADING PROBLEMS...

CHECK ON

Steinle Centerless

THREAD GENERATORS

Check (√) these ADVANTAGES...

1. WIDE RANGE OF SIZES . . . ⅛ up to 2¼ dia. (28 to 9 t.p.i.)—2¼ long.
2. SUPER-PRECISION . . Class 4 and 5 threads.
3. INCREASED PRODUCTION . . . As high as 2400 pieces per hour.
4. BETTER FINISH . . . Highly burnished.
5. INCREASED STRENGTH OF PART . . . Up to 20% stronger, by cold rolling.
6. PROCESS ALL METALS . . . From soft metals to pre-heat treated high tensile alloy.
7. CLOSE-TO-SHOULDER WORK . . . Within ½ pitch.
8. FAST CHANGE-OVER . . . Just change the rolls.

Get them ALL--and with UNSKILLED HELP

For Your

- THREAD ROLLING
- SERRATING
- KNURLING
- SPECIAL FORMING
- BURNISHING

ON

HOLLOW OR SOLID PARTS

SMALL DIAMETERS
LARGE DIAMETERS
JUST CHANGE THE ROLLS

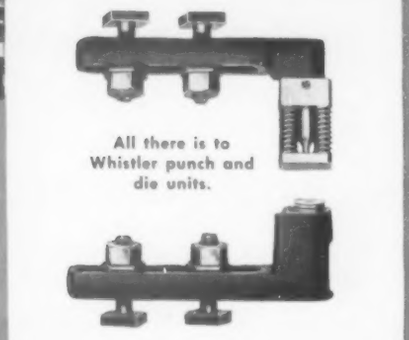
Demonstration at your convenience

THE Steinle MACHINE COMPANY

HARTFORD, CONNECTICUT

DIE COSTS TAKE A NOSE DIVE

Typical examples of set-ups made from stock units. No delay in starting production.



All there is to Whistler punch and die units.

WHISTLER Adjustable Perforating Dies Offer Added Production Economy

5-10-50 and even more different set-ups with the same dies? Impossible? Not when you use Whistler Multi-Use Adjustable Dies. For it's simple to rearrange these units . . . add or delete . . . get back into production within a few hours. Even so-called complicated arrangements are easy to set up. And, with first cost invariably less than for single purpose dies, this continued re-use of the same dies effects added economy in quickly writing off initial die investment. Over 750 prominent manufacturers have proven in their own plants that Whistler Adjustable Dies have sent costs into a nose dive.

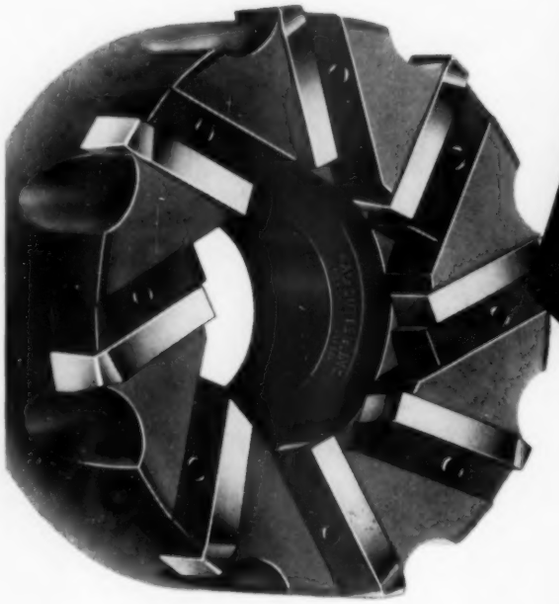
No special tools are needed. Work in practically any size and type of press. Ordering now is particularly advantageous. Large stocks of standard diameter units from 1/32" up are available for overnight shipments. Notching, group dies and special shapes and sizes can be quickly made to order. Write today to:

WRITE FOR YOUR WHISTLER CATALOGS. Know the production advantages of Whistler Adjustable Dies.

S. B. WHISTLER & SONS, INC.

752-756 MILITARY ROAD BUFFALO 17, NEW YORK

HERE'S HOW TO CUT MILLING COSTS!



NEW Cal-Cutter SOLID CARBOLOY INSERTED BLADE MILLING CUTTERS

CHECK THESE FEATURES:

- FULL-BODIED INSERTED BLADES CUT GRINDING COST APPROXIMATELY 2/3
- IMPROVED CHIP CAVITY—FREE CUTTING CHIP CONTROL
- IMPROVED METHOD OF HOLDING WEDGES
- SMOOTHER OPERATION WITH EXTRA BLADES
- MILLS ANY MACHINABLE MATERIAL
- WEDGE AND BLADE DESIGN ELIMINATE SLIPPAGE
- HIGH GRADE ALLOY STEEL BODY
- INCREASED CUTTING AND IMPACT STRENGTH OF BODY AND BLADES

Now . . . chop dollars off milling costs with this new Cal-Cutter! You'll improve work quality, speed and cutter performance because of these new and exclusive Cal-Cutter features: Larger blade size . . . tests prove this reduces blade breakage and eliminates slippage. Grinding is simplified, too . . . the extreme precision of Cal-Cutter manufacture permits grinding blades separately on a surface grinder . . . reducing grinding time by approximately 2/3. Another Cal-Cutter development . . . locating the anchor wedge behind, instead of before the blade . . . that means a more efficient chip cavity—freer cutting because chip control cavity guides chips away from the work—better quality work. A wider range of rake angles may be ground, so that the cutter (with proper quality Carboloy blades) will mill any machinable material. Two extra blades reduce chatter and greatly lengthen tool life. Get this new cutter from your Cal-Cutter distributor *now* . . . and *save!*

Editorial

« Effort Plus Skill Equals Luxuries »

THOSE WHO GNASH TEETH against the economic wailing wall lose sight of the fact that the American workman is envied by everyone in the world . . . except himself. Our system of predominantly free enterprise has created the highest standard of living the world has ever known . . . one under which any workman with the ambition and desire coupled with the proper expenditure of effort can own a house, an automobile and other "luxuries," for example.

Those who mouth pleasant platitudes about the advantages of a regimented economy under the guise of an imposed "plan" fail to realize that two basic factors enter into production . . . which, in turn, is the end of any economy and the only truly rational criterion by which it can be judged. These two factors are EFFORT and KNOWLEDGE.

The production achievement of our competitive enterprise society is by far the highest in recorded history. Men may have worked harder in other ages, and some few may have devoted more time to study in other eras, but never before have effort and skill been combined to produce goods enough to make available to all, the things which would in other systems be considered "luxuries."

Effort is important. It is work that produces an automobile or a new refrigerator or a suit of clothes. But also important is knowledge . . . to create and direct this work and to implement it into greater effectiveness.

We Americans have combined these elements. Behind the workman, skilled or unskilled, stands the engineer who designed the machine with which he performs operations in a few seconds that would take hours by hand. Behind him also is the army of tool engineers that guides him in putting these machines to efficient use with a minimum expenditure of physical effort.

Workers and engineers have combined their talents in other lands and in other times to produce goods for the benefit of each and for society in general. But, what makes the American system unique is that the relative importance of both, and their dependence upon each other, is recognized.

Another difference: Under the American system a janitor in a factory need not remain a janitor. If his abilities and desires direct him into other fields, he can study and apply himself and eventually own or manage a factory. He can—as have so many Americans—become the employer of many other men.

Only under a free competitive system can a man utilize to the fullest his innate capabilities. Only under such an economic system, which rewards the men who best combine effort and skill, can such a production record as the American one be attained.

A workman can be hired for a few cents a day in some Oriental countries. Working with only primitive tools and with only a rudimentary knowledge of the most primary production methods, how long would it take him to make a radio cabinet? Certainly longer than a day.

American assembly lines, on the other hand, involve the work of many thousands of men besides those who put together radio cabinets at the rate of thousands or more a day. What the worker on the assembly line may lose sight of is the fact that the parts he handles were made by other men . . . some of them in other companies and distant plants . . . and the entire operation directed by engineers beginning with those who drew the factory plans to the tool engineers who direct the machinery of mass production.

A single workman, performing one operation with machinery worth thousands of dollars, may be credited with several hundred radio cabinets or other commodities in a day. Because his production is hundreds of times higher than that of the Oriental worker, his pay can be higher, and is a hundred times higher.

Only through effort PLUS knowledge can high production be attained. And only through high production can "luxuries" be made available to all economic classes. The combination of these is why the American system has created the highest standard of living the world has ever known, and why life in America will continue to be free and productive of all that is required for happiness.

Our way of life is the only one under which these basic elements can be effectively combined.

Am Largent

President 1946-47

A Symposium

Tool Engineering and Profits*

Machine Tools, Fixtures and Methods, Plus Tool Engineering Ingenuity Are All Effective Profit Producers for Industry

Introduction

By Ralph E. Flanders

IT IS A PLEASURE to again be meeting with the American Society of Tool Engineers . . . which came in to fill an unfilled gap. There is a great need for a forum for discussion and interchange of experience, ideas and development outside the highly theoretical and technical era of mechanical engineering. That gap the American Society of Tool Engineers found and has filled.

How large your field of usefulness is, is indicated by the variety of subjects on your program at this Exposition. You are considering plant layout and materials handling; inspection gauges; cutting fluids; cutting tools; permanent molds; special machine design; education; economics, and last but not least, *profits*. Let us take a look, in detail, at a number of these items and see what their relation is to the balance sheet of the business.

Ralph E. Flanders **is so prominent in the affairs of the nation, and so well known throughout industry, that a thumbnail biography is at once superfluous and inadequate. Let us say that, starting as an apprentice, he has scaled the ladder as machinist, designer, engineer, editor, author, educator, corporation president and banker until, today, he stands on a pinnacle attained by few men in the industrial and economic worlds.**

A manufacturing business starts out with a product to be made, the design and materials of which are presumed to have been established before manufacture is considered. The tool engineer has had something to say about designing and materials, as we shall see later, but let us lay this point aside for the moment.

You first decide on the sequence of operations by which the parts of your product shall be produced. This, in turn, determines your plant layout if the plant is being tailored to the product and involves, as well, the equipment for moving the parts from operation to operation. In this initial problem, you have to consider what is more profitable. What, for example, is the expected scale of operations? If small, the plant layout will be simple and the handling of parts will be by the most obvious means. If large production is contemplated, you will go into such refinements as will give the lowest *cost* of production for the *rate* of production that is in prospect.

The same judgment will be applied to the next item on your program, that of selecting the production machinery. If the planned for volume is small, you will use, to a large extent, standard machine tools. If, on the other hand, the expected production is very great, you will in many instances be justified in designing—or having designed and built—completely special productive machinery.

One difficulty, which has shown up in times past and with sad experience, is the limited usefulness of completely special machinery for products subject to style changes, or for any product which is liable to meet competition from the improved designs of competitors. Care should be taken lest the investment in completely special machinery be so great as to result in heavy losses when design changes are forced upon you.

Middle Way Between Extremes

In view of this danger, an intermediate policy can sometimes be followed. This policy employs standard basic production tools equipped with highly specialized fixtures and cutting tools, which alone have to be discarded when design changes are required. An example of this, in the field of metal turning, would be the Fay Automatic Lathe and other machines of similar type.

This brings us to the subject of fixtures, which are used not only on this semi-special machinery but also on standard and special machines. In fact, in interchangeable manufacture on almost any scale production, the fixture is an essential. It saves time, and therefore cost, in holding the work in the machine. It enables the work to be held firmly in the proper position and without distortion, and this can be accomplished by a workman who has had only a few days or even hours of training. A highly skilled workman would otherwise be necessary.

A well designed fixture therefore saves time, lowers cost and increases production. It is the tool engineer's task to so design fixtures that they will meet all these requirements to the highest possible degree. Bear in mind, however, that the elaboration and consequent cost of the fixtures must bear some proper relationship to the cost of the operation and the value of the parts produced.

What has been said about fixtures is, of course, equally true with regard to jigs. In the case of the jig, there is an added importance in connection with accuracy since it is ofttimes the case that satisfactory duplication of accuracy, in even small volume production, is well nigh impossible without jigging. That is, except with such expensive machines as the jig borer and such highly skilled and highly paid operators as the workman must be who runs a jig borer skillfully.

Broad Fields for Ingenuity

Another important field for ingenuity and judgment is found in the design of dies for producing sheet metal parts. The field, here, is interesting and limitless. When quantity production is in prospect, not only should skilled attention be given to the production of the sheet metal parts, but consideration should also be given to stamping and forming out of sheet metal or drop forging many parts which are machined from rolled stock where lower volumes of production are contemplated.

After the determination of the processes, mechanical equipment, jigs, fixtures and dies, comes the important question of cutting tools. You need not be told of the great

*Condensed from papers presented at the ASTE New Era Exposition, Cleveland, Ohio.

progress that has been made in the cutting tools themselves in the last few years. This progress has been both in the design of the tools and in the material of the cutting edge. The various carbides have undergone a development which has only begun to revolutionize machine shop processes. The effective use of carbide tools, in any progressive production plant, will hereafter dominate the determination of process, the selection of equipment and, through its influence on feeds and speeds, will also determine the amount as well as the kind of production equipment.

Twenty years ago, few of us realized that there could be much more to be said about cutting fluids. We knew that they cooled the cutting edges of the tools and in some mysterious way "lubricated" them in such a fashion that a smoother finish was obtained. For some things a water soluble compound seemed best, for others, a cutting oil, while for many we used nothing at all.

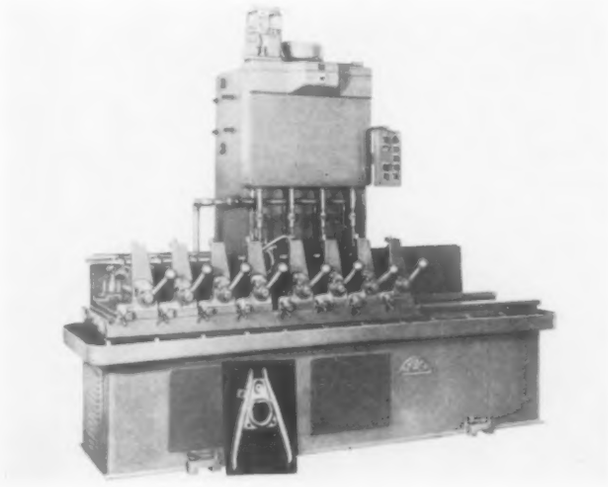
It was customary to put a little sulphur into oil used for thread cutting. This seemed to produce results, but we more or less laughed it off as being half experience and half superstition. Had we nevertheless examined this situation more carefully, we would have discovered that the cutting fluids operated in a much less simple and really a complex way and that there are hitherto undiscovered possibilities in cutting fluid development.

A case in point has been the compounding of special oils for thread grinding, where it is not the physical characteristics of the oil which alone determines its ability to keep the wheel free-cutting and produce a good finish, combined with a high rate of metal removal. It is the chemical composition of the oil that really counts. Various chrome compounds, added to the oil, produced mysterious improvements in much the same way that the old fashion addition of sulphur for thread cutting used to do and still does.

Inspection and Assembly

In these preceding paragraphs, we have taken the tool engineer pretty well through the whole process of manufacture. The question still is open, however, as to whether the parts which have been made by the processes and with the equipment he has selected are suitable for the intended use. This brings us to the important subject of inspection.

A four spindle tapping machine, for automotive front wheel support brackets. The machine is equipped with eight fixtures, whereby four workpieces are machined simultaneously while four finished pieces are being unloaded and the fixtures reloaded. The fixtures and table move hydraulically from loading to working position, the design resulting in quadrupled output—and consequent increased profit—with a commensurate decrease in physical effort. Photo by courtesy of Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit.



Fifteen or twenty years ago, the tool engineer would not have been worrying about inspection, except to make sure that his preceding work assisted in producing parts which would pass inspection at a minimum cost. Now, however, he is concerned with inspection methods themselves. He has to design various types of special gauges and gauging fixtures and even, where volume of output warrants it, automatic inspection machinery.

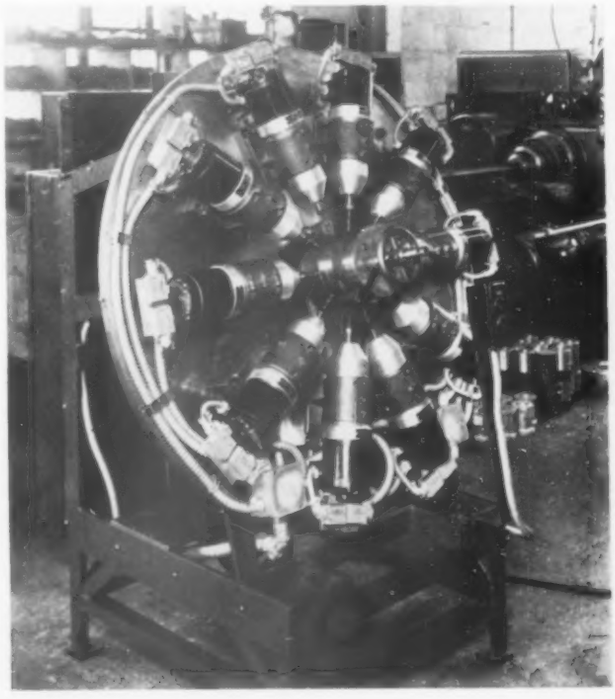
We now come to assembly. War production has made us acquainted with assembly jigs, particularly in parts which are to be electrically welded into a complete unit. For airplane frames and other war material, these assembly jigs were often of considerable size and elaboration and were of the greatest importance, both in reducing cost and increasing output. Our war experience will indicate new peace-time possibilities for this combined use of assembly jigs and electric welding.

An Expanding Field

All of this, we may be sure, indicated the expanding field of the tool engineer in playing his important role of reducing cost and increasing output. This role is indeed so important that, on occasion, it slips over the boundaries of production problems into the area of engineering design—much to the annoyance, at times, of the engineering designers. One of the subjects, on which, the product designer may well give heed to the tool engineer, is that of dimension tolerances.

Few engineers, whether engaged in designing or production, have a clear idea of the theory of tolerances. The maximum-metal side of the tolerance insures interchangeability. It makes sure that the parts can be assembled

Profits for industry are maintained by special machines such as this Simplex high production machine for drilling 20 holes in transmission bands and linings in one operation. The bands and linings are manually clamped in the fixture, then, as the operator pushes the starting button, an air cylinder moves the fixture to 1st position, while 10 holes are drilled. Next, the fixture moves to 2nd position, while the other 10 holes are drilled. It then returns to the loading position. The machine, shown with protective cover removed, is a product of the Simplex Tool Engineering Co., 2540 Park Ave., Detroit.



freely if they are to be put together by hand, or with the proper degree of pressure if they are to be force fits, or with proper allowance for lubricant if they are to be running fits. The minimum-metal tolerances, on the other hand, make sure that the looseness is not too great for serviceability. The margin left between the maximum and minimum metal dimensions determines, by its amount, the degree to which high production and low cost can be attained.

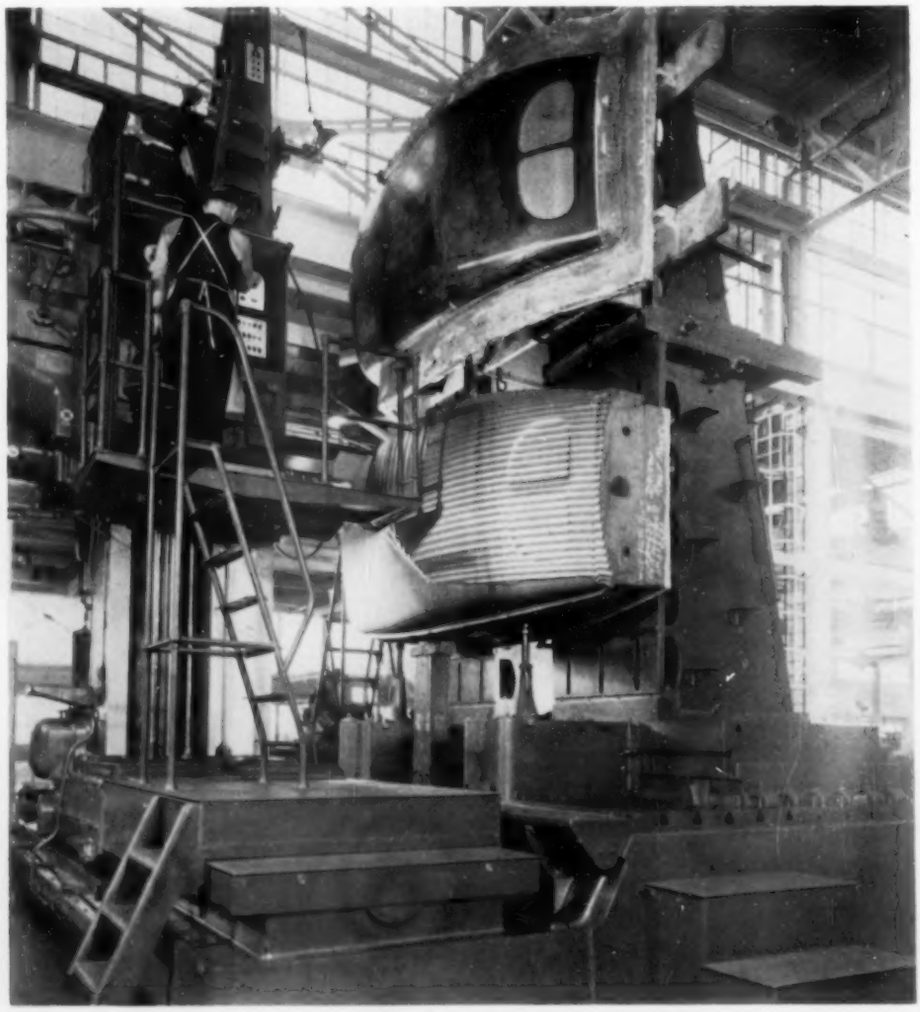
The tool engineer often struggles for high production and low cost with close tolerances which he is sure are unjustified. A heart to heart conference with the designing engineer will sometimes indicate that he is at least part way right. Sometimes dimensions have been set so close that the inevitable result was low production and high cost. In such cases, consultation with the tool engineer may indicate that more or less redesign would avoid the necessity for these expensive close tolerances.

The Tool Engineer a Key Man

This brings us to the point where the tool engineer often has something useful to say about the design of the product as well as its dimensioning. By bringing together the designing and production planning, highly useful changes can often be made in the proposed production. The tool engineer can offer useful suggestions on alterations, often minor, which will minimize machining, make for accurate, rigid holding in fixtures and provide for register points which will assure that separate operations are kept accurately in line with each other.

The tool engineer thus plays a major part in producing large volumes of serviceable, useful products at low co... He is responsible for so organizing production that t... desired volume and quantity of output can be obtained ... the transfer of the skills of mechanic and tool maker ... jigs and fixtures, which in turn can be used by semi-skill... operators. The tool engineer is indeed at the center of o... industrial system. As a result of his work, we have high... production with reduced effort on the part of the worke... and good profits at low cost.

Let me emphasize that good production, at low unit co... in comparison to wages per hour, is the essential factor i... a high standard of living. What good are higher wages pe... hour, if there are no more goods to buy with those wages... or if the goods themselves are higher in price? The founda... tion of a high standard of living comes from greater in... dividual output of better goods and services. To this high... social end the tool engineer devotes his life.



Kellering—or automatic duplicating—is one of the profit makers for industry that is finding wider application both in die making and mass production. Photo by courtesy of Pratt & Whitney Div'n, Niles-Bement-Pond Company, West Hartford, Conn.

Profit Producers for Industry

By A. G. Bryant*

Henry Ford II was recently quoted as saying that "no wage is too high if it is earned." With corresponding forthrightness, he might have added that no business profits are too high if they are legitimately earned. In this connection, it is both significant and challenging that the American Society of Tool Engineers should devote an afternoon session of its Annual Convention to the subject of PROFITS.

Profits Essential to Industrial Progress

No word in the entire realm of economics has, recently, been more maligned, misunderstood and misused. One might gather, from the comments of some of our oracles, that profit is some kind of new disease; that the profit motive underlies the many deficiencies in our present disturbed civilization; that it is the cause of much human suffering; that it must be cast out of our economy and replaced with some illusory subsidy, government control or legislative panacea.

*The thoughts expressed in this article are the author's own and do not necessarily reflect the attitude or policies of the American Society of Tool Engineers.
The Editors

The prevalence of such fallacious thinking is amazing in the face of the overwhelming evidence of benefits which the profit motive has brought to common people everywhere and for many generations. It would be difficult, indeed, to conceive of the rapid advancement of civilization, in the last several centuries, without the incentive which man derived from profit opportunities. Our entire industrial development of the past hundred years, with an enormously improved level of living for many millions, has been initiated and propelled by the inventive genius and the industrial leadership which had, as their incentive, the hope for compensation in the form of profit.

A. G. Bryant **is Vice-President of Cleereman Machine Tool Co., Green Bay, Wis., and President of the Bryant Machinery & Eng'g Co. He is 2nd V.-Pres. of the Nat'l Machine Tool Builders Ass'n and, during the war, served as Ch'man of the Machine Tool Industry's Committee for cooperation with the government, in Washington. He also served in advisory capacities on the W.P.B. and, in 1944, as Ch'man of the Committee, representing the War and Navy Departments and the Surplus Priority Administration, which developed the Clayton Formula for pricing government surplus machine tools.**

The plain economic truth is not that there has been too much business profit, but that there has been too little. Off the record but well publicized statements by some Government officials, last fall, to the effect that business could raise wages about 25% with no increases in prices and still have more profit than in prewar years were obviously made in ignorance of or in utter disregard of the facts.

For, according to Government's own data, in the four years of 1936 through 1939 only 40% of the corporations reporting for Federal income tax made any profits whatever. Even during the war, the percentage of net profit to sales after taxes was very nominal. General Motors averaged three and one-half billions of sales per year for four war years, but showed a net profit for the period of only 4.1%. U. S. Steel, in 1944, made only 3%.

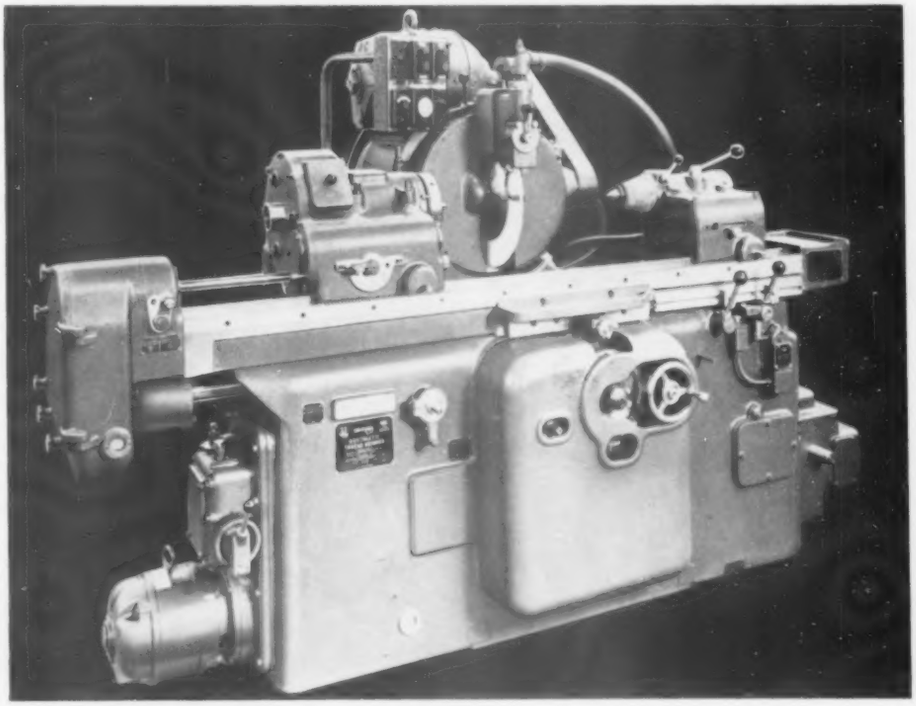
When we are speaking of General Motors and U. S. Steel, we are referring, consciously or not, to hundreds of thousands of small share holders. For out of nearly a half million corporations in this country, with a total of about twenty-six million shareholders, about one-half have a total equity of less than five hundred dollars. The profit incentive, and the will to create, to work and to invest, on the part of millions of such common citizens, is being frustrated by the paralyzing effect of diminishing profits caused by higher costs, excessive taxes and unfairly controlled prices.

Profits Are Incentive

Our economic salvation depends to a large extent upon a reversal of form, upon a stimulation of profits as an inducement for more work, for expanded operations and for the resultant creation of *more production* at *higher earned wages*. Therefore, this American Society of Tool Engineers, the work of whose members is to produce more things for more people at lower costs, must constantly have as its incentive the prospect of attractive profits.

Yours is not a profession or a business in which speculators rejoice. You can show profits only through the application of experience, industry and ingenuity. Without the stimulus of fair profits for tool engineers, methods and mechanisms will not be developed for the production of goods wanted by the general public and, as a consequence, millions will be denied a decent opportunity for employment.

Today, the world is waking up with an economic headache. It has lost, through war, enormous quantities of homes, schools, roads, transportation and facilities of all kinds, added to . . . the fact that construction of all of these was suspended during the war. We are therefore faced with the greatest demand (for consumer goods) that has ever been known. This being the case, why not grasp this opportunity and, using all of our recently acquired scientific



Profit makers for industry include machines like the Automatic Thread Grinder, by the Jones & Lamson Machine Co., Springfield, Vt. These machines are fully automatic and, once set up, all that is required of the operator is to load, press a button and wait until the automatic cycle is completed.

Extremely versatile, these grinders are not only used for grinding threads on hardened and soft material, but application ranges from such parts as rear axle housings to fine pitch thread gages. They are equally suited to precision threading and to form grinding on a production basis.

We are pleased to show this machine in connection with this Symposium on Tool Engineering for Profits since, in 1941 Mr. R. E. Flanders, who contributes to this Symposium, and his brother E. V. Flanders, were jointly awarded the Longstreth medal for outstanding achievement in the development of automatic thread grinders.

knowledge, why not also employ those sound principles of business and economics which, for generations, have been proven in actual test?

The extent to which the tool engineering profession is successful and profitable in the next few years will serve as a gauge of the relative success with which society organizes to accomplish this great undertaking. As a specific and basic means by which tool engineers and general industry may accomplish their task profitably, let us consider machine tools, the *Master Tools of Industry*. Literally, they are "Profit Producers for Industry."

600 Per Cent Increase

The machine tool industry has had violent fluctuations in its economic history. The peak annual volume reached at any time prior to this war was about two hundred million dollars, established in 1918 and again in 1929. In 1932, sales dropped to twenty-two millions, and the average of the whole industry prior to 1940 and through periods of war, prosperity and depression amounted to about one hundred millions per year. Consider, then, the impact on this comparatively small industry of an increase in shipments, in 1942, to a peak of $1,320,000,000!

Whereas on January 1st, 1940, there existed . . . in the United States a total of about 941,000 machine tools, there have been installed . . . since that time an estimated 810,000 machines. And there are now . . . about four times as many machines . . . less than ten years old, as we had at the beginning of 1940.

That this country had a technically trained, ingenious and resourceful machine tool industry with which to build our great war production machine was not due to the encouragement of any protective policy between World Wars I and II. The industry was actually impoverished at the end of the '30's, whereas it might have been nurtured by long range, constructive policies. And today, far from having learned any lesson from the events of the past three decades, the Government has prevented the industry, by excessive profits taxation and by renegotiation, from attaining reasonable reserves or adequate net profits.

The industry built the machines to produce war equipment, and more than 90% of these same machines can be utilized in peacetime production. The industry must therefore carry as a burden, and in competition with its current production, the several hundred thousand government owned surplus machines. What will be the effect of this situation in the machine tool industry upon the production plants and the tool and die shops of America? For one thing, it is obvious that the *users* of machine tools have an opportunity, without parallel, to reduce their costs and increase their profits by taking advantage of the present machine tool market.

While the cost of living has gone up approximately one-third during the war, the prices of machine tools have remained at the level at which they were frozen in 1941. The typical machine shop, of today, has a labor cost at least 50% higher than before the war, and certainly individual productivity has not generally increased! The profit producing possibilities, from the installation of modern machine tools, are therefore accentuated by the present price level of machine tools.

The manufacturing plant which, before the war, expected a machine tool to pay for itself in direct savings in not more than five years, can now adjust its formula. For, with average labor costs up approximately 50%, proportionate savings will permit the same machine tool to amortize itself in three and one-third years back.

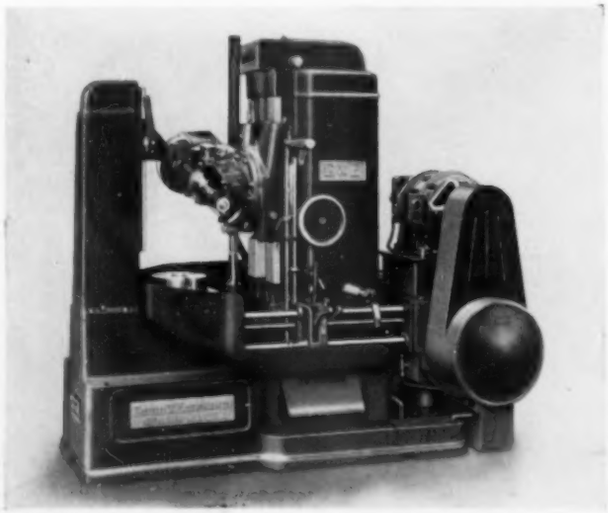
Price Adjustment Necessary

Such a maladjustment in prices cannot be indefinitely continued . . . because, machine tool sales in this country have now decreased to about 20% of the peak war rate, and with machine tool builders facing the same relative increases in labor and other costs that prevail in other metal working industries, they cannot continue, for long, to manufacture and sell without equivalent price adjustments.

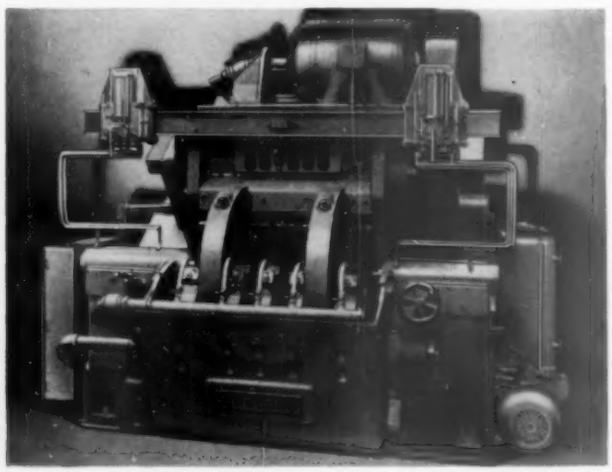
After taxes and renegotiation, many machine tool builders had a net return . . . during the war of only about 3%. With greatly reduced volume and greatly increased costs, in 1945 and 1946, the desperate need for higher prices is becoming daily more apparent.

Machine tool users, however, benefit from the remarkable low cost of distribution prevalent and traditional in the machine tool industry. A large portion of all American machine tool builders sell their product entirely or in part

Gear Hobbing, by which gears and worms are continuously cut with hobs, is among the tool engineering techniques developed for profits in industry. Photo by courtesy of Gould & Eberhardt, Irvington, N. J., one of the pioneers in gear hobbing.



Among special purpose machines, tool engineered for profits, are automatic lathes especially designed for the mass production of automotive crankshafts. The machine shown is the Model 1-LB Automatic Crankshaft Lathe, one of several types for this purpose, manufactured by the R. K. LeBlond Machine Tool Company, Cincinnati, O.



through long-established machine tool distributors having exclusive responsibility for selling their products and for rendering to their customers a specialized engineering service.

The typical discount, from machine tool builders to their distributors, is 12½ per cent, and for this the distributor maintains a staff of experienced sales engineers, carries customers' accounts and renders both advisory and operating service. Contrast this rate with typical discounts of from 20% to 30% paid for the distribution of other mechanical products such as automobiles, tractors, construction equipment and farm implements! The economic condition of machine tool distributors reflects the industry situation, for during the war, after excess profit taxes and renegotiation, typical distributors earned less than 1% net return of sales.

Opportunity in Surplus Tools

Machine tool builders who, because of their size or the highly specialized nature of their product, maintain their own sales organizations, have a similar low cost of distribution. The purchaser of machine tools, therefore, benefits in the resulting low price of these machines as influenced by the remarkably low cost of machine tool distribution.

A great opportunity exists for America, today, in the availability of enormous quantities of war surplus machine tools. At the close of the war, approximately one-third of all of the machine tools in existence in continental United States were government owned. A large share of these have been or will be offered for sale.

The National Machine Tool Builders' Association, with the collaboration of the American Machine Tool Distributors' Association, has from the outset taken a most statesmanlike attitude towards the use and disposal of government owned machine tools.

New Machines Mean Higher Standards

Having, in four years time, produced the equivalent of the previous forty years production of machine tools, the industry has stood appalled by the effect, upon its future business, of the dumping of government surplus tools upon the market. Facing this condition realistically, however, it has . . . taken its stand, first for the establishment of an adequate, strategic government reserve of machine tools, and secondly, for the speedy sale of the balance to private industry.

Regardless of the effect upon the industry, it has pointed out that the installation of the relatively new machines bought, during the war, by the manufacturing plants of this country, would increase their efficiency and thereby raise our national standard of living.

As a potential first line of national defense, the government has been repeatedly urged to set aside a reserve of approximately one-half of the total machines that it possessed during the war. No one, even remotely connected with the job of getting this country mobilized for war production, can fail to realize the critical urgency of having available, for immediate use, large quantities of stored machine tools. We devoutly hope that they will never be needed, but a great reserve of machine tools should serve as a potent deterrent to another Pearl Harbor.

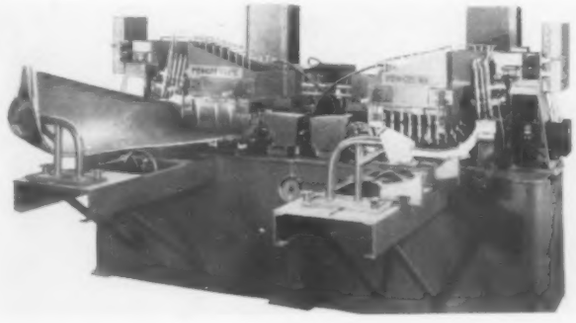
There is a recognized trade truth, in the machine tool industry, to the effect that the only really good customers are those . . . already well equipped. Shops that have obsolete and worn out machine tools have usually less progressive managements and are usually high-cost and low-profit. They either do not have the resources, or the vision or the know-how, of a smart shop management which appreciates that one of the best ways to assure low costs and high profits is by having the latest and finest machine tools.

Replace Obsolete Tools with Modern

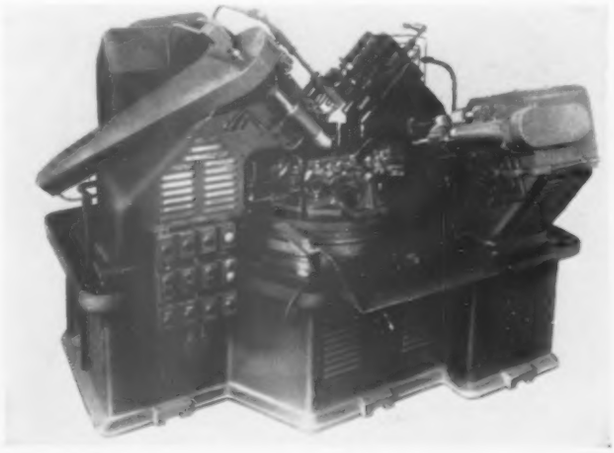
The industry hopes, therefore, that thousands of obsolete or broken-down machines now limping their way through production tasks will be replaced with modern tools purchased from government surplus. Under the Clayton price formula . . . machines may be purchased at a price level that should attract even those manufacturers who are trying to do post-World War II jobs on pre-World War I machines. Although the purchaser of a government surplus machine can secure no warranty of condition, the machine tool industry recommends, to many manufacturers, that they consider buying government machines which on an average, will greatly exceed in productivity and useful operation the equipment now tolerated in many plants.

Cooperating actively with the Government in the widespread disposal of government surplus, the machine tool industry also feels that there is ample ground for expecting that the most progressive manufacturers will install the very

Duplex Ultra-Speed Welding Machines coordinate production of both right hand and left hand automobile fenders at the rate of 150 per hour. The machines, which may be arranged in two sections and located to suit, have two welding positions—right and left hand—when joined. Thus, two operators can maintain a continuous supply of matched fenders at the rate required for final assembly. These machines are among many that are Tool Engineered for Profits.



Tool Engineered for Profits is this Hy-Mac 4-Stage machine designed for drilling, spot facing, counterboring and tapping vacuum holes in intake manifolds. To operate, the workpiece is manually loaded and clamped, then, on closing a safety door, electric contact is made and the machine automatically indexes to working position. All heads then advance and complete these alloted cycles, during which another part is loaded. Production is at the rate of 120 manifolds per hour. Photo by courtesy of Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich.



latest designs of machine tools. In many cases, postwar products require such accuracies and finishes, and are made of such new materials that none but the latest machine tools will suffice for low cost production. With such late tools, and with prices scaled proportionately 25% lower than the general level, the user's investment should be safe and profitable.

Yet these machine tools, which offer extraordinary profit making possibilities, actually represent the smallest part of the total cost of production. The National Machine Tool Builders' Association has pointed out that depreciation, maintenance, taxes and insurance allocated to final machine tool operating costs constitute a total of only 3.4% of the grand total shop costs, the balance of 96.6% going into labor, materials and indirect expenses.

Another indication of the economy of machine tools and their effectiveness in production is illustrated by the figures of the United States Bureau of Census for 1939. In that year, this country's total production of manufactured goods was valued at $58,000,000,000. These goods depended upon machine tools, and at that time the total valuation of machine tools, used in production in the United States, was about three billion dollars. In other words, the machine tool plants of this country supported a total production of manufactured goods amounting to nearly twenty times the total value of the machine tool investment.

The installation of new machine tools, in 1939, represented only about 17/100th of 1 per cent of the value of the country's manufactured products . . . so relatively insignificant that its influence on the price of consumer goods is almost infinitesimal. On the other hand, it is obvious that, without the use of such machine tools, the consumer would pay (if he could afford them at all) prices for goods many times present day figures.

Knowledge Versus Ignorance

Members of the American Society of Tool Engineers, of course, have a better appreciation than others of the economic value of machine tools in this country's future. However, understanding as we do the importance of the machine tool, some of us may perhaps overlook the fact that there are men in public life who are ignorant of the facts.

It would seem that everyone should realize that the production of more goods, at lower cost, constitutes America's hope for survival in the coming competitive struggle. Therein, also, lies our hope for further raising the general standard of living in this country. It is only by getting better products, at a lower cost, that more people can acquire the goods to improve their physical standards.

With no machinery at its disposal, China has been unable, in centuries of effort, to save its teeming millions from an impoverished existence. It is awakening . . . to find that mechanization and technological development are essential to the solution of its national problem. Coolie labor represents poverty and degradation, while mechanization, based on the use of modern machine tools, produces more goods more cheaply and directly raises a nation's standard of living.

Fortunately, sound thinkers are more and more teaching the importance of these economic truths. A few months ago, in his financial column in *The New York World Telegram*, Mr. Ralph Hendershot stated, quote: "The difference between the high living standards in this country and China . . . are due primarily to the use of labor-saving machinery. We might point out, too, that the war was won only because we had labor-saving machinery. These facts should be self-evident. . . . We should build a monument in this country to the labor-saving devices." Unquote.

Those of us who are closest to this situation must take an individual responsibility for seeing to it that our friends and our associates understand these simple fundamental facts. We must . . . promote our private businesses by seeing that outmoded and worn-out machine tools, in our plants, are replaced either with good war surplus machines or with the newer models of machine tools.

Relationship of Tool Engineering to Economics

By C. E. Ives

AT THE TIME when Benjamin Franklin was in England, the British Parliament was assumed to be composed of representatives of three estates—The Lords Spiritual, The Lords Temporal, and the Commons. But Edmond Burke, pointing to the Press Gallery, said "There sits the Fourth Estate, more powerful than them all." No one at all familiar with the influence and power of the press can doubt the validity of Burke's appraisal.

The foregoing is taken from a speech by Dr. John J. Caton, past director of the Chrysler Institute of Engineering in Detroit, who very aptly refers to us tool engineers as Gentlemen of the Fifth Estate. Without going into the extent of our influence, I should like to impress you with the responsibility which attends our position; hence these remarks in which it is hoped to bring out the relationship of the tool engineer to the field of economics.

***C. E. Ives*, owner of the Ives Engineering & Planning Co., Chicago, was graduated from University of Wisconsin with degree B.S. in Mechanical Engineering. Subsequently, he has engaged in consulting and contracting, in developing mechanical and electrical products, and as Industrial Engineer and architectural designer. During the war, he served as Director of Contract Distribution, W.P.B., for the state of Wisconsin. A past Director, A.S.T.E., and a member of Chicago Chapter, he is widely known as an inventor (holding about 28 patents), author, illustrator and educator.**

To develop my theme, may I first define a few terms such as money, wealth, and capital. In the beginning, before the advent of man, the only things which existed on earth were primitive fowls, beasts, and fish, the soil and its vegetation; the streams of water; and the deposits within the earth—Animal! Vegetable! Mineral!—termed natural resources. This factor, "*Natural Resources*," is the first great factor in economics.

The next step in the building of economics was the advent of Man—just simply "us." We came into this world with a basic trait which we can summarize by the simple word "want." We could not exist without this inherent trait. Our wants are many and varied, and to list them would fill quite a large encyclopedia. We, with our wants, are such a basic fundamental in the field of economics that I will refer to it here as the second great factor, *MAN*.

Man's basic wants call for satisfaction for such things as food, shelter, clothing, and amusements. These products,

hen produced and ready for use or consumption, in the conomist's terms, are called *WEALTH*, and this is the hird basic factor in economics. These products are of two lasses: first, those products whose end use are for imme- liate consumption—"consumer's goods"—and secondly, hose products which are used as an aid in the production f consumer's goods. Such products are called "capital goods," or, in the economist's terms, just "capital." These wo forms of goods, "consumer's goods" and "capital goods," are the two forms of *wealth*.

Having thus defined these three basic terms, Resources, Man and Wealth, we may now define the five essential factors in the *production* of *WEALTH* or, in other words, the factors which are necessary to convert natural resources into wealth for the use of man. For convenience in remembering, five terms beginning with the letter "M" have been chosen.

The prime factor is *Management*. It is the factor that perceives the market need, designs the goods, and coordinates the other four factors in producing the goods. The second factor is *Manpower*, and the third factor is *Money*. These three factors, *Management*, *Manpower* and *Money*, are three economic divisions of *Man*. It might seem somewhat novel to refer to money as being an economic division of Man. To clarify this, however, money might be referred to as "canned manpower."

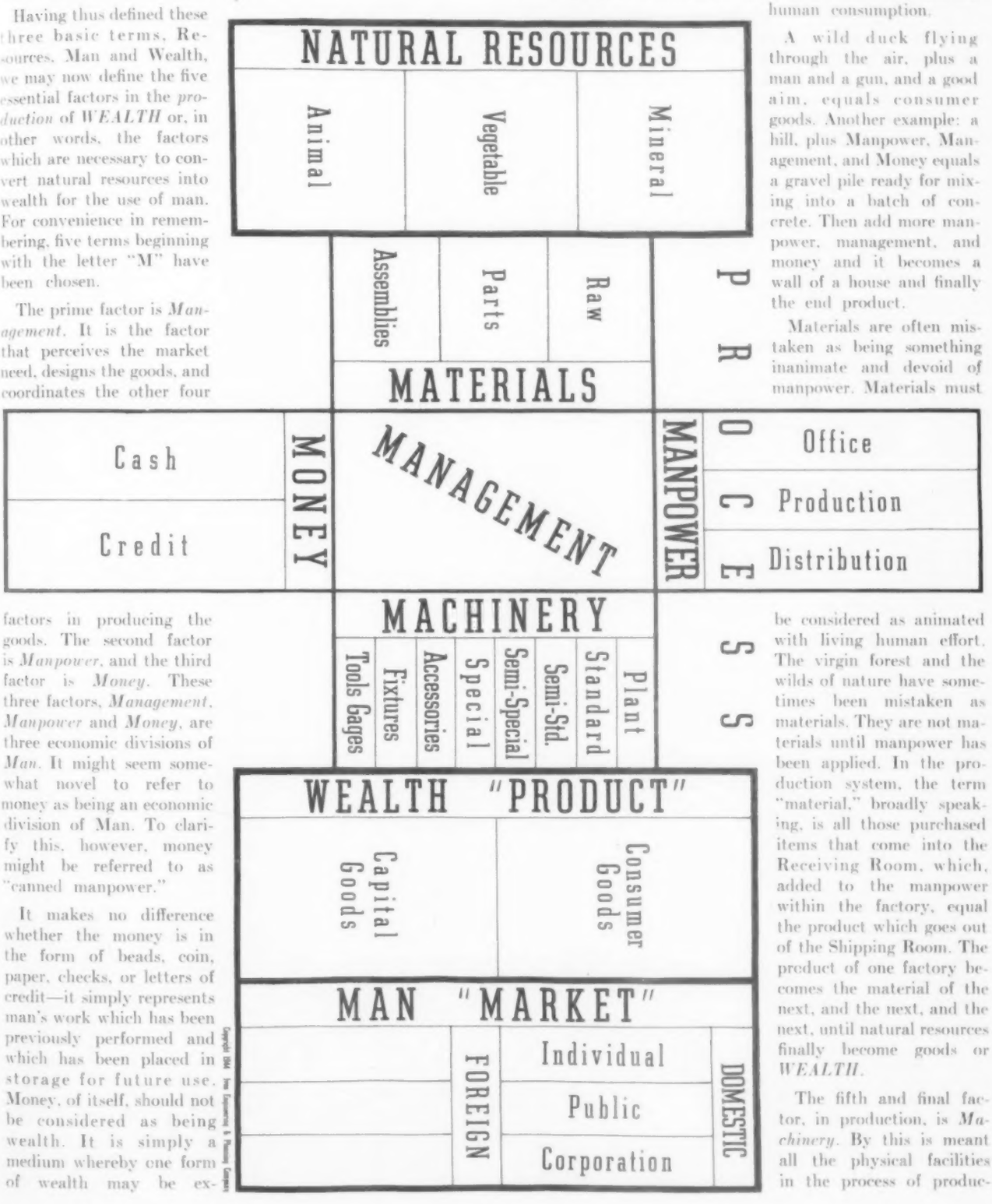
It makes no difference whether the money is in the form of beads, coin, paper, checks, or letters of credit—it simply represents man's work which has been previously performed and which has been placed in storage for future use. Money, of itself, should not be considered as being wealth. It is simply a medium whereby one form of wealth may be exchanged for another. Hence, we may say that money is almost synonymous with manpower.

The fourth factor in the production of goods is *Materials*. This is a combination of the first three added to the first basic economic factor. Natural resources, plus Manpower, Management, and Money, equals Materials. Take for instance, any material, whether it be in the form of raw material, parts, or assemblies, and subtract from it Manpower, Management, and Money, and the only thing there is left is Natural Resource which, in itself, is valueless for human consumption.

A wild duck flying through the air, plus a man and a gun, and a good aim, equals consumer goods. Another example: a hill, plus Manpower, Management, and Money equals a gravel pile ready for mixing into a batch of concrete. Then add more manpower, management, and money and it becomes a wall of a house and finally the end product.

Materials are often mistaken as being something inanimate and devoid of manpower. Materials must be considered as animated with living human effort. The virgin forest and the wilds of nature have sometimes been mistaken as materials. They are not materials until manpower has been applied. In the production system, the term "material," broadly speaking, is all those purchased items that come into the Receiving Room, which, added to the manpower within the factory, equal the product which goes out of the Shipping Room. The product of one factory becomes the material of the next, and the next, and the next, until natural resources finally become goods or *WEALTH*.

The fifth and final factor, in production, is *Machinery*. By this is meant all the physical facilities in the process of produc-



Copyright 1944 Tool Engineering & Planning Company

tion, whether it be farm, factory, or peanut stand. Machinery is the *Capital*, and includes the plant, everything within the plant, the mechanical and electrical units and all tools and gauges. The machinery of our production plant is the product of another neighboring production plant and is the *Capital* used in our production. And here is where the Tool Engineer comes in!

The foregoing three basic factors of economics, combined with the five factors of production, form the fundamental building blocks of the entire productive system, and is the foundation of economics, or of the business relationship of man to man. To mix metaphors, these building blocks are put together, link by link, to form productive chains from natural resources to consumer's goods. The chains likewise are branched to form systems. These systems have become so inseparable, economically joined, and so interrelated that, when an illness appears in one of these fundamental elements, it has an effect on the entire system in the same way as a missing link has on an intricate machine.

The economic illness we went through during the late depression, and during the late World War, and the illnesses we are now going through, cut down national wealth and the power of producing national wealth to a small percentage of its potential possibilities.

More Work Hours Necessary

The late depression, caused by overspeculation on the part of many, was a serious setback to wealth production. The late war, with its wanton waste of time and materials, and its training in war production, slowed down civilian production to such a low ebb that critical shortages of usable civilian wealth developed. Now that the war is behind us, the struggle for labor supremacy has not only kept this class out of the production lines, but has seriously retarded and handicapped the remainder of active producers further, and has aggravated the problems of returning veterans. It is quite natural, therefore, that shortages of consumer's goods, nationally and internationally, instead of becoming easier, are becoming even shorter in a great spiral which not even national controls can check. The only check on this shortage is more work hours of production.

We concoct better formulae for the product, bread, devise better machinery for the planting and harvesting of wheat, better methods of milling and baking. Then, like the little red hen, we ask "Now, who shall eat this bread?" The great struggle will always be those who are unwilling to work, but ready to eat. It is contrary to the first law of nature to try to get something for nothing; but it is quite possible to cut down the total national hours of labor for equivalent units of national wealth; that is, by the usage of brain power to harness the physical power of nature. Therefore, the widespread development of brain power and the efficient use of it by training can but surely result in more and better products and production with the same amount of physical work.

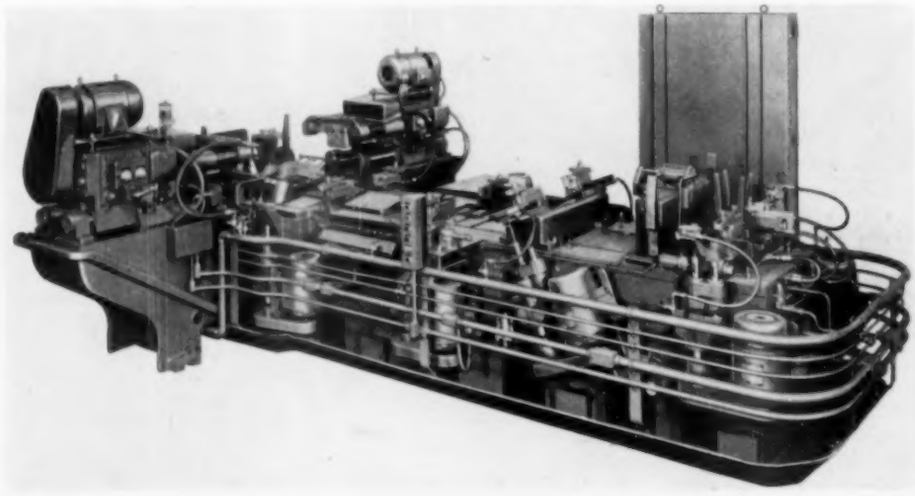
Machinery for National Wealth

The great field of the Tool Engineer is just this, and that is the fifth factor in the production system; namely *Machinery*. We must design more machinery and more effective machinery, and be more intelligent in its application. In other words, the Tool Engineer must increase the number of brain power hours so that ever greater and greater wealth may be produced by the same number of manpower hours. Thereby, the cost in manpower hours of the common necessities of life will be less. The national debt will be cleared off in less time through the production of this greater wealth. The world will be reconstructed and fed by this increased production.

Fellow Tool Engineers, design your machinery and tools with this new inspiration! Lay out your processes with the thought that they will bring about more wealth. Be patient and painstaking in keeping your records accurate and orderly. Be thoughtful in organizing your departments for harmonious coordination with other departments. Expedite the flow of materials smoothly through your factory. Do your utmost in your position, better than it has been done heretofore, and be confident that he who puts forth intelligent and conscientious effort, will be amply rewarded.

Automatic Drilling of Assembled Auto Frames

Of especial interest to the automotive industry is an automatic machine, for drilling spring suspension holes and body and engine mounting holes, in assembled automobile frames. The machine, which is designed and built by the Snyder Tool & Engineering Company, Detroit, accommodates three different sizes of frames. Adjustment to longer or shorter frames is effected by moving the entire clamping bracket, as well as the several spindle units, into positions required for correct location of holes in the individual frames. Change-over is rapid and settings may be accurately duplicated.



Frames are located on equalizers and are positioned and clamped by means of air cylinders and cam closers. Vertical and horizontal spindles are driven from individual motors, with feed effected by action pinions actuated by one hydraulic cylinder. Both the cylinder and the feed mechanism are mounted inside the welded steel base. Electric wiring, and piping for air and coolant, are all on the outside of the machine, for easy accessibility. The piping serves as a guard rail for the operators. Production rate is high and the design eliminates the need for several machines that would otherwise be needed for different frame sizes.

By **J. F. Allen**

Exploring Carbide Possibilities in Single Point Turning*

Hard Carbide Research Another Step In the Progress of Metal Cutting

THE SUBJECT OF this paper has reference to a program of metal-cutting research being conducted in a special laboratory at the Warner & Swasey Company. After describing the equipment that has been set up for this work, and some of the methods involved, it might be well to briefly discuss the complexity of the metal-cutting problem, and then go on to a discussion of some of the test results and findings.

Before starting the description of the equipment and methods involved, however, a few comments on the relation between cutter performance and machine tool design may be in order for a clearer understanding of the factors involved.

J. F. Allen **was graduated with degree B.S. in Mechanical Engineering from George Washington University. Joining the Warner & Swasey Company, he served as engineer in the Laboratory. In '42, joined the Naval Ordnance Laboratory, Washington, D. C., where he shared in directing development of mines and depth charges. Upon expiration of war duties, he rejoined Warner & Swasey as engineer on special assignments, including Metal Cutting Research. He is a member of A.S.M.E. and the Cleveland Engineering Soc'y.**

During the past year or two, the wide publicity given to the use of negative rakes on carbide cutters, both in milling and turning work, and the resultant increase in performance, has undoubtedly created, in many minds, the impression that all present-day machine tools are on the verge of complete obsolescence.

This impression is erroneous. There is a very good reason why complete obsolescence of present day machine tools cannot be created through improved cutter performance alone. Cutter performance is only one of many factors involved in machine tool development and the impact or influence exerted on machine tool design by the appearance of new cutting materials and the development of new techniques will depend largely upon the complexity of the other factors involved.

For example, let us suppose that a new cutting material should suddenly appear that is 100 per cent better than the existing cemented carbides. Then, some of the factors that would have to be dealt with—as in the case of the turret lathe—in order to attain the full utilization of this material, would be as follows:

(1) Handling time:—that is, the time required for set-up, chucking of the workpiece and removal, positioning the cutters, engaging feed levers, changing speeds, pushing control buttons and other incidental motions. (2) Motor limitations, such as the time required to start and stop and, among other things, the frequency of reversals obtainable without overheating. (3) Speed and load limitations of bearings. This is specially acute on a turret lathe where a spindle must be large enough to allow bar stock to pass through. (4) The effect of heat upon the alignment of the spindle with the bed ways and the consequent effect on accuracy of machining. (5) The effect of unbalance of workpieces such as forgings or castings rotating at high speed. (6) The application of a cutting compound to work rotating at high speed. (7) Safety of personnel. (8) Operator fatigue. (9) Control of chip formation and disposal of chips. (10) The cost of improvement as related to the gain in performance.

New Materials, New Machines

There actually have been some cases observed where an increase in cutting speed has resulted in lowering production and increasing cost because of the presence of these other factors. This does not mean that full utilization of the new material would not be eventually realized, but that, because of the numerous factors which must be considered, improvements are bound to be relatively slow.

In the type of machine tool where the limiting factors are not so numerous, the appearance of a new cutting technique or cutter material will have a much more immediate effect on machine tool design, and obsolescence of

*Resume of paper presented at the ASTE New Era Exposition, Cleveland, Ohio.

FIG. 1 below.

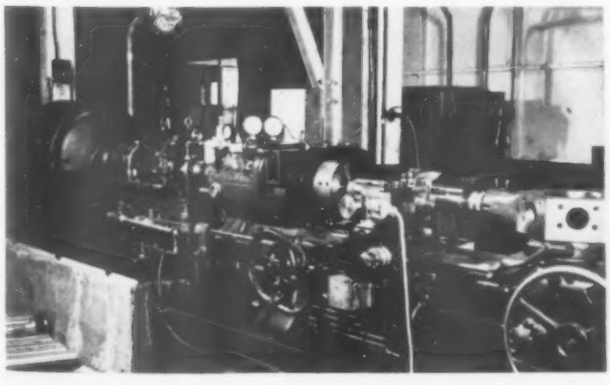
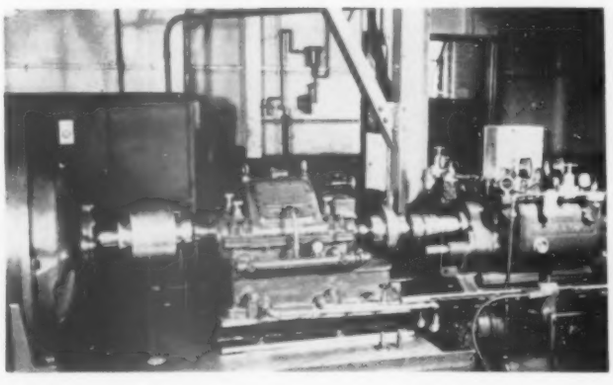


FIG. 2 at right.



existing equipment will come more quickly. That is why the recent development of the use of negative rakes, in milling, almost immediately resulted in the appearance of new milling machines designed expressly for the milling of steel with carbides. The absence of such factors as workpiece unbalance, and of inertia loads imposed on the drive motor by spindle reversals and speed changes, had much to do with the quick and successful utilization of the new carbide techniques.

A Challenge Met

Although the immediate effect of improved cutter performance upon machine tool design may be relatively slight in most cases, because of the complexity of the other factors involved, it is by no means to be considered unimportant. On the contrary, cutter performance is the major factor dominating all of the others in any machine tool that removes metal. Everything about a machine tool represents an attempt to obtain maximum performance from the cutting tool, and the history of design shows a continual effort, on the part of the machine tool builder and the cutter manufacturer, to keep pace with each other's development and progress.

The appearance of high speed steel cutters in the early 1900's, of Stellite cutters in 1915, and of the sintered carbides in 1928, have each been a challenge to our design engineers —a challenge which, we believe, had been ably met and returned to the cutter manufacturers each time. And it would be a mistake, at this time, to assume that the appearance of new cutting materials has ended with the carbides that are in common use today, or even that the technique of use has been fully developed for the present carbides.

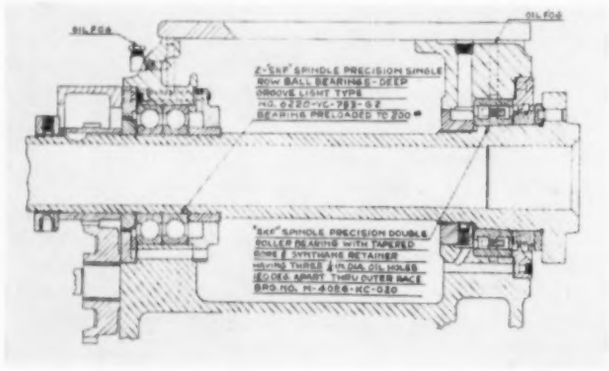
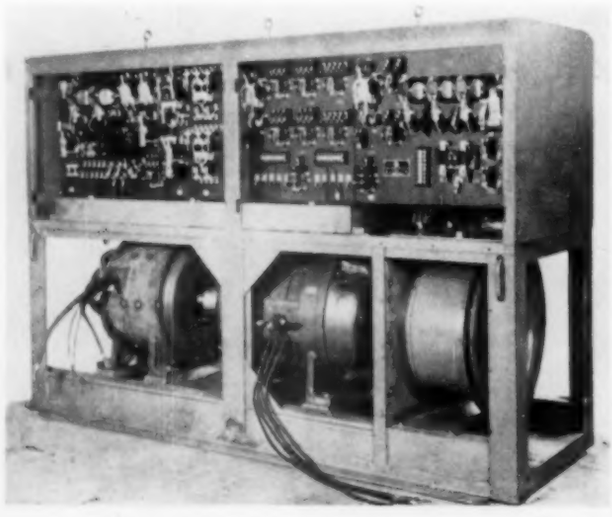

OIL FOG
OIL EGA
2-3/8" SPINDLE PRECISION SINGLE ROW BALL BEARINGS - DEEP GROOVE LIGHT TYPE
NO. 6220-VC-793-GZ
BEARING PRELOADED TO 200
8" SPINDLE PRECISION DOUBLE ROLLER BEARING WITH TAPERED BORE & SYNTHANE RETAINER
HAVING THREE 4 IN. DIA. OIL HOLES SPACED APART THRU OUTER RACE
BRG NO. M-4086-KC-020

FIG. 3 above. FIG. 4 below. FIG. 5 at right.



It is therefore quite important that the machine t builder learns everything he can about metal cutting order that development and design programs be direct toward anticipating possible demands for higher speed a more power that will come with the development of n techniques or cutting materials.

We have found that it is not enough to observe what being done on present day equipment, because, the facto which control the production rate on a machine tool a almost always too numerous and often too obscure to permi an accurate evaluation of cutter performance. Machin vibration, cutter overhang, heat treatment and micro-stru ture of materials being cut, the system of cutter supply ease of cutter replacement, operator attitude and care i handling cutters, shape of cutter required for workpiece coolant or cutting compound application, workpiece rigidity presence of or lack of mill scale—all of these and many more factors offer pretty good assurance that every cutter application will be different even on similar cuts in a single shop.

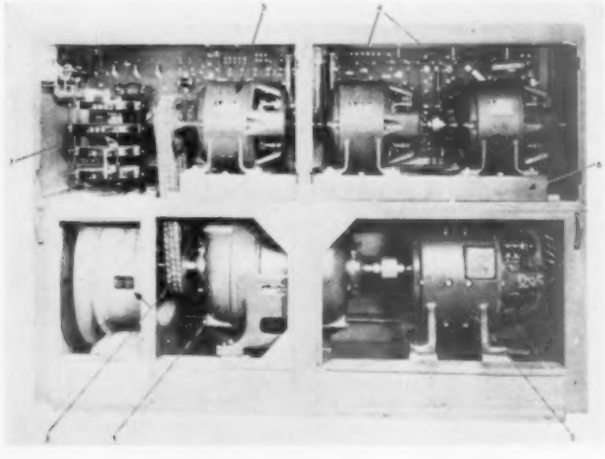
The only way to determine what constitutes a set of ideal conditions, for maximum rate of metal removal, and to learn how fast it is possible to remove metal efficiently and how much power is required, is through a program of research where all conditions can be accurately controlled. The following is a description of the equipment that has been set up for this program and some of the methods involved.

In order to reduce the possibility of running into speed and power limitations, a turret lathe of 15 hp having a normal top speed of 920 rpm was equipped with a spindle drive with a 100 hp motor to provide over 5000 rpm. By removing all gears and clutches from the head of the machine, and driving the spindle by coupling it directly at its rear end to the motor drive, the variable conditions present in multiple gear trains and clutches were eliminated. Fig. 1 shows a general view of the machine and drive.

Concrete Beds Absorb Vibration

The foundation is an integral block of reinforced concrete $1\frac{1}{2}$ ft. thick under the lathe and $3\frac{1}{2}$ ft. thick under the motor, which is a dc variable speed rated at 50 hp but capable of delivering 100 hp for limited periods of time. Its *no load* speed ranges from 11 rpm minimum to 1900 rpm maximum. Constant horsepower is delivered above 400 rpm and constant torque is delivered below that speed. Dial thermometers, on the head of the lathe, indicate bearing temperatures of both front and rear spindles, and all rotating parts are in dynamic balance to eliminate machine vibration. Fig. 2 shows another view of the spindle drive.

Motor speed is increased three times by driving through a speed increasing unit composed of a single pair of 10-in.



ide herringbone gears lubricated with an oil spray. Oil forced, under pressure, from a built-in pump to four plain abbitt bearings, and is cooled by tap water running through oils in the pump. The coupling to the motor is of the type hich will slip under excessive overloads, and the coupling the spindle is of the gear tooth type. A tachometer generator driven from the output shaft of the speed increasing nit is connected to a calibrated voltmeter to provide continuous indication of spindle speed.

Oil Mist Lubrication

The spindle bearings are lubricated with a fog of oil (oil mist) which is obtained by atomizing 8 to 10 drops of oil per minute for each bearing. Air pressure through the atomizers is maintained at 30 to 40 lb., the air passing through a filter system to eliminate moisture. Fig. 3 shows the spindle mounting. The front bearing is somewhat special in that the roller cage is made of plastic, to reduce the amount of heat generated, and the oil fog is delivered through holes in the outer race. The rear bearings are standard ball bearings with a light preload.

Fig. 4 is a front view of the power cabinet showing the control panel, and Fig. 5 a rear view of the cabinet showing the motor generator set in the bottom and a 5 kw generator, above, for exciting the field of the dc generator shown at the lower right. This power plant was originally designed as a boring mill drive and the two extra 5 kw generators were intended for powering the feed motors. At the upper left can be seen the motor driven bank of rheostats for remote control of spindle speed.

Fig. 6 shows a view of the master control panel. The voltmeter and ammeter indicate the drive motor armature voltage and current. The meter at the upper right is connected to the tachometer generator previously mentioned and is calibrated to indicate spindle speed. With the dial at the lower right set to the diameter of stock being cut, and the selector switch set to the S.F.M. position, the meter will indicate cutting speed in surface feet per minute. The selector switch may also be used to connect the output of the tachometer generator to an oscillograph for recording the speed and any changes that might occur while cutting.

The spindle can be started and stopped, and increased or decreased in speed, by pushing the buttons at the bottom of the panel. The power supply includes a dynamic braking circuit which will bring the spindle to a stop in from 1 to 4 seconds depending upon the speed at which it is being run. The pendant push button, on the left, operates a solenoid which disengages the feed. This is used in case of emergency.

In attempting to determine the power required, to cut metal, it is common practice to run a prony brake test on the spindle and to work from a calibration curve which indicates hp output at the cut for any power input to the motor. Knowing the power consumed at the cutter, and the cutting speed, it is a simple matter to compute the tangential cutter force. This procedure was avoided in this case because of several reasons.

In the first place, it would require quite an elaborate prony brake set-up to absorb 100 hp at the lower speeds and high torques as well as at the upper speeds of several thousand rpm. In the second place, whereas one calibration curve will suffice for a single speed motor, a family of curves would be required for a motor operating at variable speeds to secure acceptable accuracy. The original work involved, and the interpolation continually required, makes this procedure undesirable where a simpler method of determining power at the cut is possible.

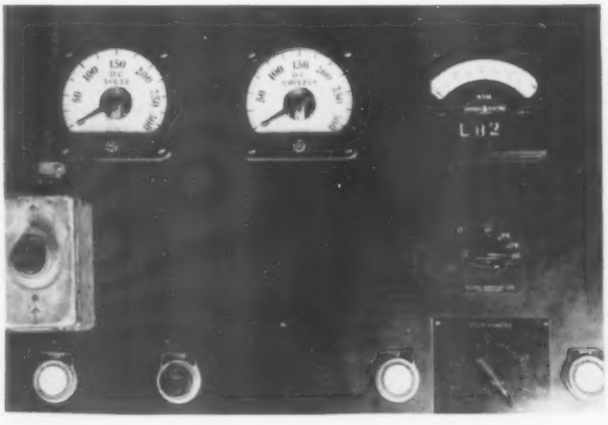
Fig. 7 shows a cutter holder built by the Schiess-Defries Co., in Dusseldorf, Germany, and acquired by Warner & Swasey in 1937. By using this instrument, it is possible to determine the three components of force on a cutter. The tangential force can be used to accurately determine the power consumed at the cut without having to take into account the drive efficiency. The feeding force and radial or end force are also determined. From the standpoint of machine design, these data are highly desirable and can not be obtained by the motor calibration method.

Transmission of Cutting Forces

Fig. 8 shows a sectioned drawing of the cutter holder. The cutter holder is supported against any downward force on two pins which bear on a rectangular steel plate. This plate is supported on two knife edges and will deflect under any load transmitted to it through the pins. In a similar manner, the radial component of cutting force is transmitted as a thrust against the spherical seat shown at the rear end of the cutter holder.

The load, in this case, is borne by a steel disc 3/16" thick which is supported all around its edge. To load this disc, at the center, an intermediate plate is provided with a slight spherically ground surface which contacts the face of the flat disc at the center only. A safety feature is also obtained in that, under excessive deflection, a bearing will result over

FIG. 6.



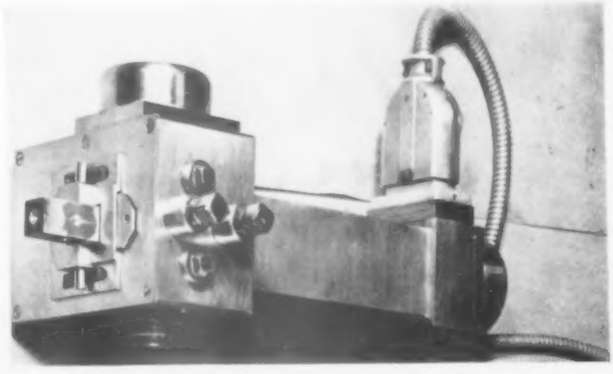
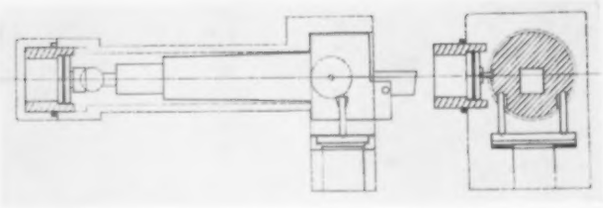


FIG. 7 above.

FIG. 8 below.



the entire surface and the intermediate plate will then take up a portion of the load. This would occur only under conditions of accidental overloads.

The construction of the feeding component measuring unit is identical with that of the radial component unit just described. The feeding component of force on the cutter is transmitted through a single pin to the loading plate which then applies the force to the center of the deflecting disc. As originally received, the deflection of each of these steel plates was detected by a magnetic coil in which the reluctance of the magnetic circuit was sensitively varied by the movement of a diaphragm resting against the steel deflecting plate. Coil output which was a function of force component was registered on a milliometer.

Strain Gages Improve Tests

A great improvement was effected by discarding the coils and cementing Baldwin-Southwark SR-4 bonded wire resistance strain gages to the deflecting plates. Fig. 9 shows the cutter holder disassembled. The rectangular plate, with its knife edge supporting block and loading pins are shown. The spherical seat at the rear end of the holder can also be seen. The springs are for preloading the load carrying plates.

Fig. 10 shows the cutter holder mounted in place on the lathe and ready for a cut. The test logs to be cut are two feet long by 4¼" in diameter. It is planned to cut alloy steels down to 2½" in diameter in the annealed condition and then to heat treat the 2½" diameter bars to various degrees of hardness for further cutting tests. On mild steel the logs are cut down to one inch diameter and then discarded. These test logs are gripped in the 3-jaw chuck and supported at the other end on a live center.

In removing metal by single point turning, the rate of metal removal will vary for different diameters even though the surface feet per minute and depth of cut are held constant. For instance, with a .125" depth of cut and .015" feed per revolution, and a surface cutting speed of 1000 feet per minute, the rate of metal removal at 4¼" O.D. is 2.18 cubic inches per minute whereas at 1½" O.D. it is only 0.8 cubic inches per minute.

Micrometers are used to measure the work diameter before and after each cut. Cutting speed is first set to the desired value as indicated on the cutting speed meter and then it is checked with an accurate surface speed indicator held against the rotating log. In order to facilitate computation, tables were constructed around a basic cutting speed of 1000 S.F.M. and .125" depth of cut and .015" feed to yield the rate of metal removal for any of the diameters used and with corrections for deviation from basic speed or depth of cut. Tables were also constructed to yield hp at the cut for any value of tangential cutting force observed and with corrections for deviation from basic speed. Computed values are quickly found from these tables which are accurate within 1% of observed data.

Fig. 11 shows a general view of the instrument group with the master control panel on the left. On the table in the center is shown a three channel strain gage amplifier, one channel for each component of cutter force. This amplifier operates with a 5000 cycle per second carrier which is modulated by the change in resistance of the active strain gages in the cutter holder. These resistance changes are amplified and delivered to the oscillograph shown on the table to the right. The oscillograph changes the electrical signals received from the amplifier into moving light beams which trace a record of the cutter forces onto photo sensitive paper.

Automatic Recording Recommended

When taking a high speed cut on a small diameter bar, the total time for traveling the length of cut may be as little as 20 seconds. Automatic recording is not only desirable but has proven necessary on many occasions. Immediately below the oscillograph is a box which contains a timing circuit which may be adjusted to give any desired length of exposure on the oscillograph photographic recording paper.

Fig. 12 shows a solenoid operated paper drive clutch. The pulley is driven continuously, but the photographic paper is run past the light beam aperture for exposure only when the clutch is engaged. As the clutch engages, the light source within the oscillograph is switched on simultaneously and a record is made until the clutch disengages and the light goes off.

Fig. 13 shows the cam arrangement for operating a limit switch which is connected to the timing circuit previously mentioned. The tube which carries the adjustable screws travels with the carriage of the lathe as the cut progresses.

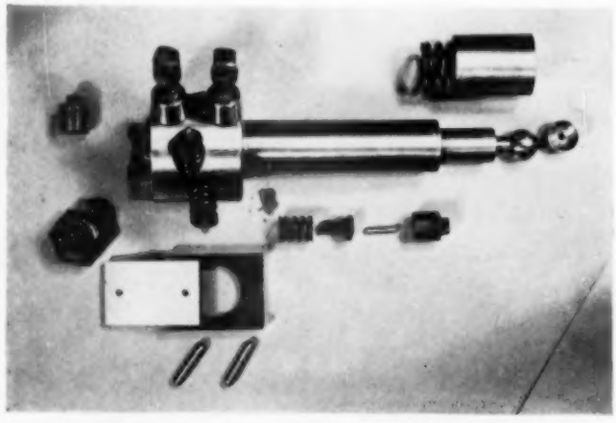
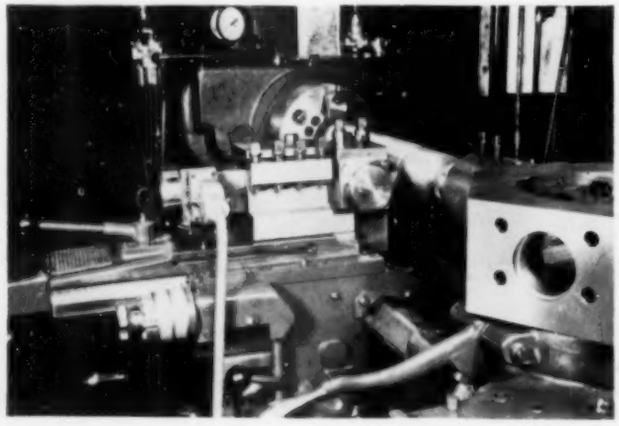


FIG. 9 above. FIG. 10 below. FIG. 11 at right.



Contact of the screw head with the limit switch is only momentary, but the timing relay picks up on this contact and breaks the circuit after whatever length of time has been chosen.

Fig. 14 shows a sample record. Length of exposure was about 4 seconds and 2 exposures are shown. The paper was traveling at a speed of 6 feet per minute, and a record was taken at the beginning and at the end of the cut. The disturbance, just prior to the end of the cut, is an example of the type of behavior that would have escaped detection except through the use of an oscillograph and a force measuring instrument. This disturbance was due to action of the chips against the shoulder left by the previous cut. This cut was taken at 1000 feet per minute; the depth of cut was $\frac{1}{8}$" and the feed was .015" per revolution. The material cut was SAE 1020 hot rolled steel.

Fig. 15 is a record taken with a paper speed of 185 feet per minute. Distance between vertical line is $\frac{1}{60}$ of a second. The total record shown here represents $\frac{1}{4}$ of a second. The vibration shown is at a frequency of about 480 cycles per second and represents the frequency with which the built up edge is forming and sloughing off.

This concludes the description of equipment and instruments used, except to mention that the tips of the cutters are photographed at regular intervals at a magnification of eight times on a 5 x 7 camera equipped with a 48 mm Micro-Tessar Lens. The cutter tips are examined frequently under a binocular microscope. Edge abrasion, and cracks or chips, can be measured to 0.005" with a Filar micrometer eye piece attachment. The cutters are rough ground on silicon carbide wheels and finished on diamond wheels. Chip breaker grooves are ground in with diamond wheels, and the carbide tips are torch brazed with the utmost care to prevent cracking. Cutter angles are checked on an optical comparator.

Control of Variables

The choice of a program of metal-cutting research involves the consideration of a tremendous number of variables which must be as closely controlled as possible. Of all the persons whose interest has been stimulated in the past few years by the numerous discussions on metal cutting, there probably are not more than a few who fully appreciate the complexity of the subject.

To partially illustrate how involved a program of metal-cutting research might become, refer to Fig. 16. In the left column is a list of items which are required to describe a cutter shape, and to the right are shown possible variations of each item. These variations are the minimum number which can be considered. In the case of back rake, for example, the variations of which are shown as positive, zero, and negative, this could easily be increased to include further variations such as 3° negative, 6° negative, 10° negative, and so on. Even with this scant list of variations, the total possible number of combinations of cutter shapes comes to 12,000. Further variables which must be considered are shown on Fig. 17.

Fig. 18 shows a summary of the variables described, in which the total number of combinations amounts to 165,888,000—i.e., the number of cuts which must be taken to cover all of the possibilities described. This number accounts for one cut only for each combination. Unfortunately, the erratic nature of cutter behavior requires many cuts under one set of conditions before an average can be found that has any meaning. Furthermore, this number does not include consideration of cutting compounds, nor the effect of cross section of the cutter shank, nor rigidity of cutter mounting, nor adjustment of spindle bearings, nor the effect of height of cutter above and below the centerline of the spindle. The inclusion of these factors would cause the total possible combinations to skyrocket into astronomical figures.

A Narrow Field Essential

Faced with the gigantic proportions of the metal-cutting process in all of its phases, it is compulsory that any one metal-cutting research program be confined to a relatively narrow field of endeavor. The particular field chosen, of course, will be that which seems to offer the best possibilities for obtaining an answer to a particular problem, which in the case of this particular research program is to determine how much power is required and how fast metal can be removed when carbide cutters are operated under condi-

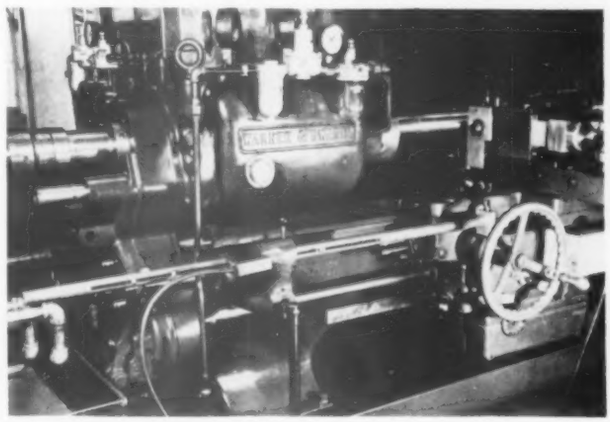
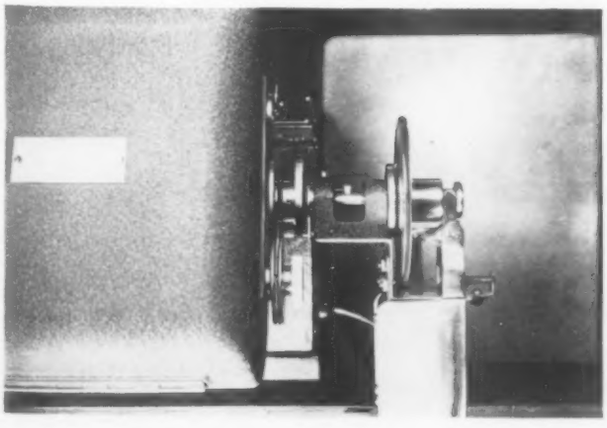


FIG. 13 above.

FIG. 12.



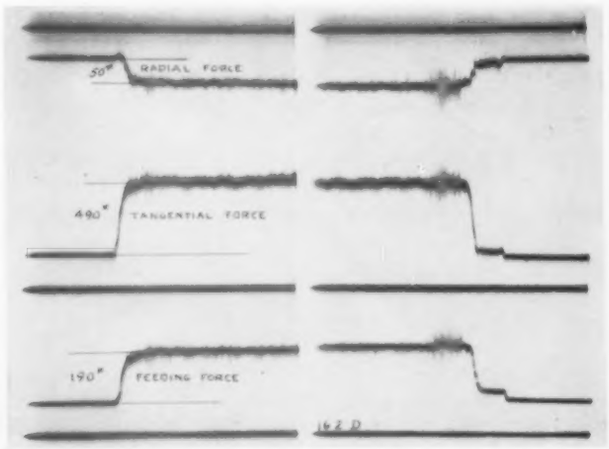


FIG. 14 below.

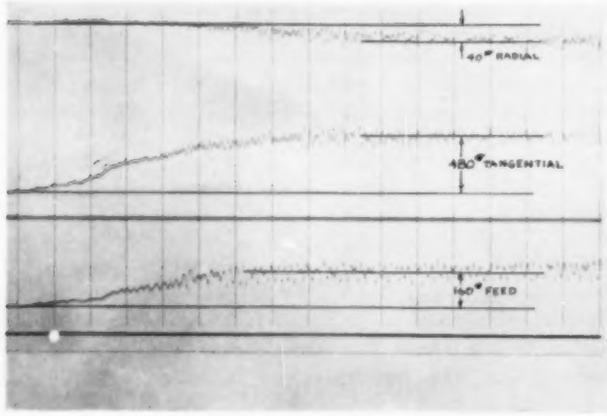


FIG. 15.

tions that can be closely controlled. It is also desired to determine just what constitutes a set of ideal conditions and the extent to which development must be further carried to provide these conditions in the standard machine tool.

This discussion of the magnitude of the metal-cutting problem has been included in order to give emphasis to the fact that there never has been and probably never will be a complete and simple solution to the problems encountered in the use of carbides. Feed and speed tables are never offered as anything more than a general guide for a starting point. To obtain maximum cutter performance, on any one job, requires that the job be lived with until the experience gained points the way toward the best solution of the problems peculiar to that particular job. This should be kept in mind during the remainder of this discussion.

Now, for our experiences in metal cutting under controlled laboratory conditions. These results of our tests are not necessarily applicable to the many problems of production which you are running up against as tool engineers. (In fact some of our findings may even appear to be in direct contradiction with your own experiences.) These results are offered in the hope that we may contribute something to the knowledge of carbide usage and perhaps stimulate further thought on the subject.

In most metal-cutting research programs it has been customary to investigate the relation between cutter life and cutting speed. We have approached the problem a little differently. Instead of covering a range of cutting speeds from low to high, we first selected an arbitrary set of conditions where cutting speed was maintained constant at 1000 feet per minute. A $\frac{1}{8}$" depth of cut and .015" feed per revolution were chosen as representative of common practice. SAE 1020 hot rolled steel from a single mill heat was used to insure uniformity of material being cut. This set of conditions has been used as a sort of rough screening operation.

When contemplating the possibilities of carbide use, two questions come to mind immediately:—what shape of cutter, and what grade of carbide, will give the best performance?

FIG. 16. ITEMS WHICH DETERMINE CUTTER SHAPE	
Back Rake Angle	Positive—Small Large Zero Negative—Small Large
Side Rake Angle	Positive—Small Zero Negative—Small Large
End Relief Angle	Slight Moderate
Side Relief Angle	Slight Moderate
End Cutting Edge Angle— 12,000 possible combinations	Small Large
Side Cutting Edge Angle	Zero Small Large
Nose	Sharp Point Small Chamfer Large Chamfer Small Radius Large Radius
Chip Breaker	None Land & Groove Type Parallel Step Type Angular Step Type

In the tests made to determine the effect of cutter shape on power required and cutter life, a general purpose grade of carbide was used. Fig. 19 shows the type of cutter used in the tests. The shape of tip shown in the inset is only one

FIG. 17. CUTTING SPEED, FEED AND DEPTH OF CUT	
Cutting Speed	Slow Medium Fast
Depth of Cut	Light Medium, 27 combinations possible Heavy, 18 combinations by selection
Feed	Light Medium Heavy
Grades of Carbide	Three grades each of four different brands = 12 carbide materials
Cutter treatment	Tip finish extremely smooth, cutting edge honed off Tip finish moderately smooth, cutting edge not honed off 8 combinations
Material cut: Assume 8 including various heat treat of alloy steel	

of many used and demonstrates the direction of the three components of cutting force.

This cutter was designed to provide greatest ease of reconditioning and most economic use of the carbide. In order to recondition a damaged cutter of this type it is only necessary to heat the shank until the braze melts and to move the tip out toward the side until the damaged portion of the tip extends out over the shank. The tip can then be dubbed off and re-ground with scarcely any grinding of the steel shank.

Fig. 20 shows four types of cutter tip grinds that were tested. The series 4 cutter is of the general type used in our own shop. The tangential, feeding, and radial component forces which existed after five minutes cutting time are shown. The power required at the cut and specific hp are also shown. This power was chosen to represent a 100% reference datum to which all other cutters are compared.

Series 5 will be recognized as a standard parallel step type of grind, and Series 6 is the well-known angular step type. Series 7 is a cutter having a negative back rake of six degrees and a six degree positive side rake. Fig. 21 shows the different types of chips referred to under Remarks listed on the previous slide. Fig. 22 shows four more cutter styles and the forces, power, specific hp and miscellaneous observations concerning each.

From Series 8 to Series 9 was a long step. It will be noted, under the remarks for the Series 8 cutter, that the finish was scratched by the chips. An increase in negative back rake was observed to produce greater surface marring by the chips which would slide down into the work with such force as to become partially welded to the work surface. Many ideas were tried to keep the chips from the work which otherwise would have had an excellent finish. The result of these attempts was the Series 9 cutter which has a 30 degree chamfer half as wide as the depth of cut. The chips were curled by the groove and work finish was improved by the steep negative rake at the front edge. Series 10 and 11 are variations of negative rakes and chip grooves combined.

Negative Rakes Reduce Breakage

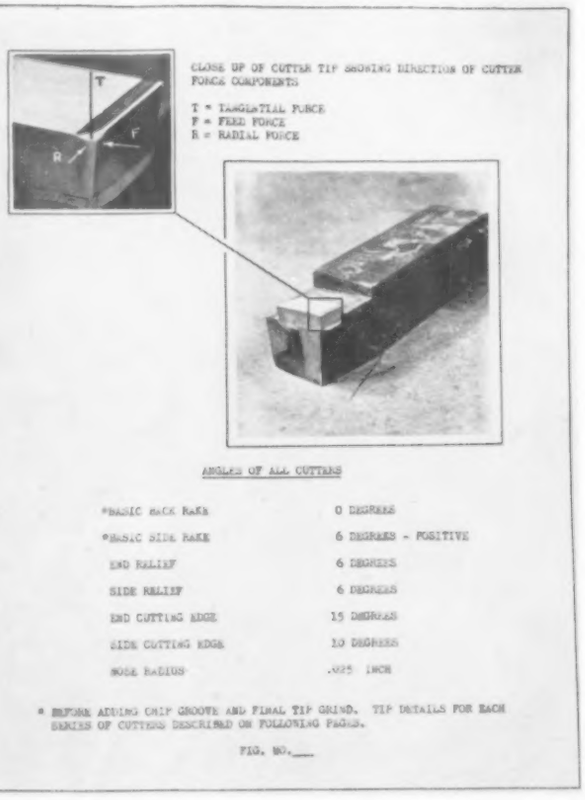
Fig. 23 shows four more variations of negative rake cutters with chip grooves. Special attention is called to the power required by the Series 13 and Series 15 cutters both of which have negative side rakes. Some of the conclusions that may be drawn from the results of these tests are as follows: Negative rakes are indicated as a possible solution to problems arising from the breaking of cutters at the cutting edge. Such breakage is often experienced on interrupted cuts, workpiece runout, and the turning of forgings, castings or bars where scale cuts must be taken. Breakage is also often encountered in the use of the so-called harder carbides which are more brittle than the general purpose grades. The hard grades are those usually recommended for light finishing cuts such as in precision boring of steel.

FIG. 18. SUMMARY OF VARIABLES INVOLVED IN METAL CUTTING RESEARCH PROGRAM

Combinations of Cutter Shape	12000
Combinations of Speed, Feed, and Depth of Cut	18
Grades of Carbide to be used	12
Combinations of Cutter Treatment	8
Kinds of Material to be cut	8

Total combinations involved equals product of above, as follows: 12000 x 18 x 12 x 8 x 8 = = 165,888,00.

FIG. 19 below.


T
F
R
CLOSE UP OF CUTTER TIP SHOWING DIRECTION OF CUTTER FORCE COMPONENTS
T = TANGENTIAL FORCE
F = FEED FORCE
R = RADIAL FORCE
ANGLES OF ALL CUTTERS
*BASIC BACK RAKE 0 DEGREES
*BASIC SIDE RAKE 6 DEGREES - POSITIVE
END RELIEF 6 DEGREES
SIDE RELIEF 6 DEGREES
END CUTTING EDGE 15 DEGREES
SIDE CUTTING EDGE 10 DEGREES
NOSE RADIUS .025 INCH
* BEFORE ADDING CHIP GROOVE AND FINAL TIP GRIND. TIP DETAILS FOR EACH SERIES OF CUTTERS DESCRIBED ON FOLLOWING PAGES.
FIG. NO.___

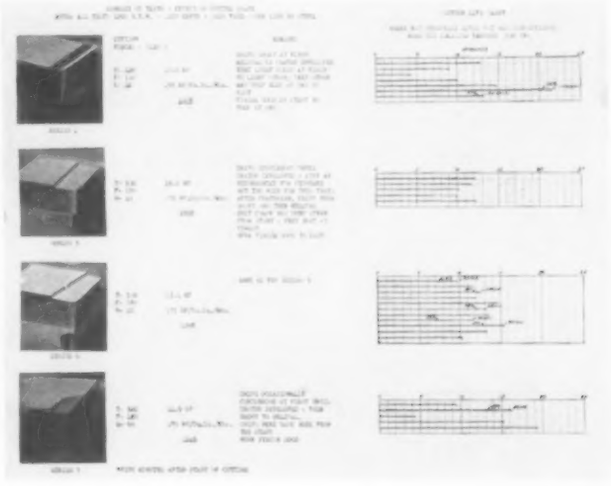


FIG. 20 above.

FIG. 21 below.

However, negative rakes should not be used indiscriminately since they do require considerably more power than positive rake cutters. Negative rakes do not contribute materially to protection against normal cutter wear, i.e., edge abrasion, and although there appears to be a little improvement in workpiece finish, when using negative rakes, the finish obtained with positive rake cutters is highly satisfactory especially for roughing work where power required often demands first consideration.

A negative back rake may be used with either a positive zero or negative side rake but, where a negative side rake is used, the back rake should be negative an equal or greater amount than the side rake. For example, a 6° negative back rake may be used with 0° side rake, but, a cutter having a 6° negative side rake should have at least a 6° negative back rake as well. Otherwise, the power consumed at the cut is exceptionally high.

Comparison of Performance

The next phase of the program was to compare the performances of various makes and grades of carbides. For these tests, it was necessary to choose a cutter shape which would be suitable for the brittle, hard carbides as well as for the softer grades. The Series 14 cutter was chosen in spite of the fact that power required was 38% higher than for the Series 4 cutter.

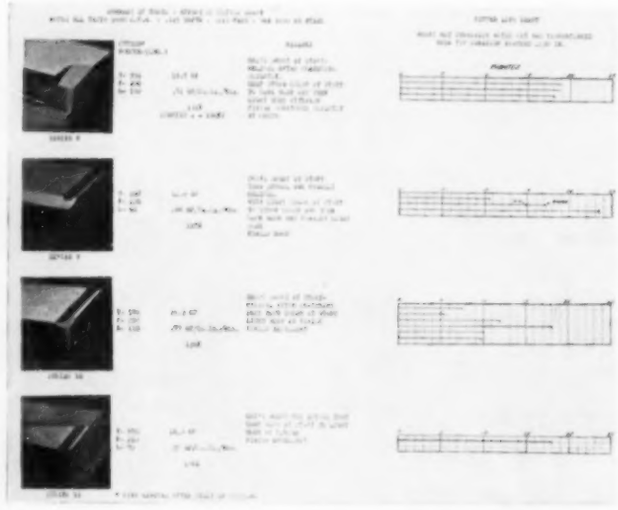


FIG. 22 above.

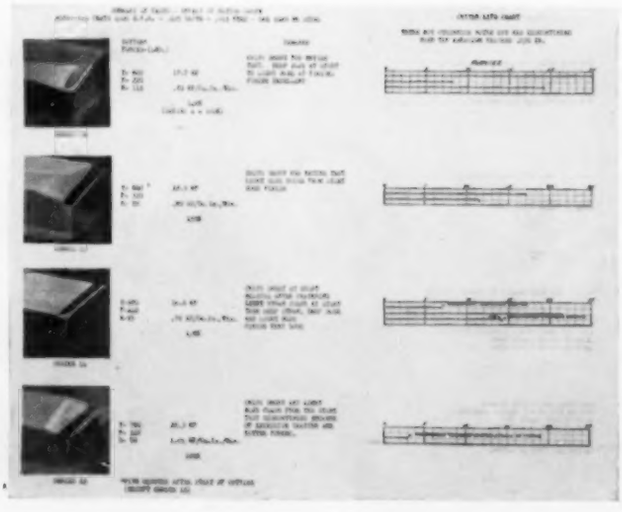


FIG. 23 below.

Fig. 24 illustrates the evaluation of the Series 14 cutter shape. Sketch A represents the Series 4 cutter which required the least power of all the cutters tested. It will be noted that, where the inside edge of the land meets the tip radius, there is a sharp point where stresses will be concentrated. For the softer grades of carbide this condition is not good but it is still not too serious. However, for the hard grades of carbide early breakage is encouraged by such a stress concentration especially where a tension component of force is likely to exist. Note that the width of land cannot be decreased without increasing the sharpness of this point.

Sketch B shows an improvement over the condition of Sketch A. This is a hard grind to control even with a small diameter grooving wheel and even though the sharp point of stress concentration has been eliminated, there is still a tension component set up at the front end of the chip groove. Sketch C shows how both stress concentration and tension components at the tip can be avoided. The cutter was first ground to the general shape shown in Sketch A. The tip was then chamfered at a compound angle to give a negative side rake of 6° and a negative back rake of 20°. A further advantage in this shape is that the land may be decreased in width without the objections encountered in the shape shown in Sketch A. The chamfer is 1/16" wide.

Long Life with Hard Grades

Fig. 25 shows how the chip is caused to veer away from the cutting tip. This photo was taken after 40 minutes of cutting at 1000 feet per minute and it can be seen that the tip of the cutter is still in excellent shape. Failure occurred a few minutes later by chipping of the side cutting edge. As shown here it was still removing 22 cubic inches of metal per minute efficiently in spite of its battered appearance.

Using this shape cutter 27 different grades of carbides were tested and it was very soon learned that the hard carbide grades possess some remarkable characteristics and an ability that is not generally appreciated. Cutter life was observed to be 6 to 8 times that obtained with the general purpose grades.

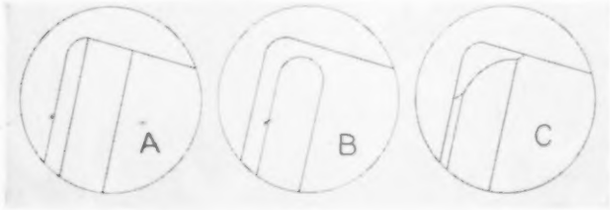


FIG. 24 above.

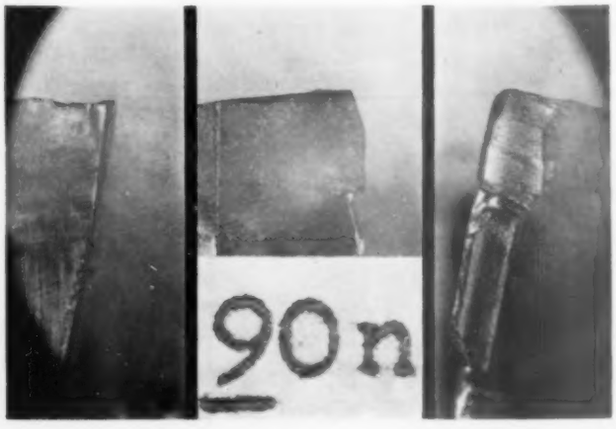


FIG. 25 below.

The chief disadvantage in the use of hard carbide is its temperamental nature. Extreme care must be used in handling to prevent accidental chipping. Machining conditions must be exceptionally good. Failure of the cutter occurs by breaking instead of normal wear or edge abrasion. Breakage is usually so severe that the workpiece would have to be scrapped because of gouging and the cutter is usually so badly damaged that it either has to be discarded or must undergo a major reconditioning operation.

For some time now, we have been directing our attention exclusively to the hard carbides in a study of the factors which contribute to failure by breakage. The results have been gratifying in that we have been able to bring these factors under control to a degree where serious breakage has been eliminated. Failure by chipping of the side cutting edge is still a problem but neither the workpiece nor the cutter are scrapped by a failure of this type and so one of the most serious objections to the use of hard carbide has been eliminated.

To predict the future of the hard carbides it is only necessary to recall some of the headaches and discouragements that were experienced when carbides first made their appearance in 1928. (After 18 years there are still some shops that claim they are unable to use carbides.) The same sort of discouragement and innumerable difficulties can be assured anyone today who will take a carbide material which is recommended only for light precision boring and who will attempt to put it into general use on roughing work.

Just as the improvement in carbides and carbide techniques since 1928 have resulted in our present day production records it follows that new production records will be achieved through further improvement in materials and techniques. Our work in metal cutting research seems to indicate that until further improvement in cutter materials is obtained the greatest promise for increased performance lies in the development of the use of the hard carbides and it is toward the encouragement of endeavor in this direction that we have presented these findings to you.

Automatic Broaching Cuts Production Costs

RELATIVELY SIMPLE BROACHES, used with modern, automatic cycle equipment, produce complex parts and effect substantial savings. The clutch disk, Fig. 1, is a typical example of work produced with new equipment by the Colonial Broach Co., Detroit. The disks are of mild steel, 14" inside diameter and each approximately 0.115" thick so that a stack of 13 disks, which can be worked simultaneously, is about 1½" high. By simply changing adapter rings in the fixture, six different sizes of disks can be handled by using the same fixture.

FIG. 1, left. A number of 88 tooth clutch disks are "ganged" for broaching internal teeth at one pass per group of teeth. Holding fixture is progressively indexed until all teeth are broached.

FIG. 2, below. Modern, automatic cycle broaching equipment, designed and built by Colonial Broach Co., Detroit, produces complex parts with relatively simple broaches.

The broach can cut 120 teeth or more, 10 at a time, around the inside diameter and, since it is made in six sections, it is possible to replace each section if desired. Total broach length is 66", with length of stroke 72", and the broach has sections which rough, semi-finish, and finish the tooth contours to full depth in one stroke.

The 4" wide broach sections are attached to a broach bar which has a minimum deflection insured by close fitting guides placed above and below the work. The clutch disk teeth are cut by pushing the bar carrying the broaches down past the work.

Automatic work cycle is started by pushing the "start" button, the second from the top in the control group at the right, Fig. 2. The top button, at the right, and the button on the left column, are "stop" buttons. Additional controls include a selector switch for automatic or hand operation. Other buttons are for initial tryout and for checking the setup such as the "inching controls" for moving the "fixture in," "fixture out," "ram down," and "ram up."

The rings are stacked in the sliding fixture when the fixture is in the extended position and then slid forward for the broaching. The work is held securely in the fixture by four dogs which are manually clamped. With this equipment, 10 to 12 disk loads can be produced per hour. Since each set contains 13 individual disks, this is an output of 130-156 pieces an hour per machine. Counting 12 sets per hour, this is a total production time of only 5 minutes per set.

Pipe Thread Standard

NUMEROUS INQUIRIES have come into our Editorial Offices for information on screw and pipe thread dimensions, and especially on the comparatively new 1/16" taper pipe thread. While it is planned to adequately cover this and kindred subjects in ASTE Handbook, now being compiled, those interested may obtain immediate data from the "Screw Thread Standards for Federal Service Handbook H-28 (1944)." The book is obtainable from the U. S. Department of Commerce, Nat'l Bureau of Standards. Price 60 cents.

By Lev A. Trofimov

Mechanical Variable Speed Transmissions*

Infinitely Variable Transmissions, Synchronize Machine Cycles and Provide Correct Speeds and Feeds

THERE ARE five known principles upon the bases of which variable speed devices can be made. Fig. 1 shows these principles.

The first is a gear change, or a sliding gear transmission. It is the most widely used variable speed device for machine tools, and provides a stepped type of speed variation with unlimited speed range. The torque increases in inverse proportion to speed. A sliding gear transmission is the only varying speed device that has constant horse-power characteristics. It seems there is no limit to a safe torque because, every time the speed is changed a new gear is introduced which is designed to stand the greater torque.

Born in Russia, *Lev Alexander Trofimov* attended the Military Academy of Orenburg and the Imperial Naval Academy at St. Petersburg (now Petrograd). He later served in the Imperial Russian Navy as commander of a submarine. Emigrating to the United States in 1918, he joined I. I. Sikorsky, famous aircraft designer. In a period of three months, he and Mr. Sikorsky made a project of a 1600 HP bombing plane.

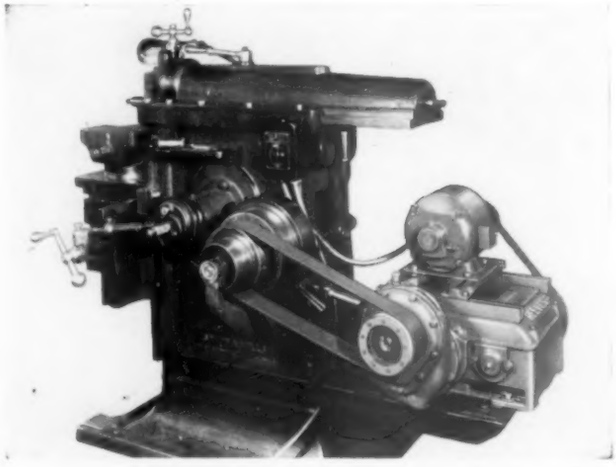
Leaving Sikorsky, he was briefly employed by the Templar Motor Car Co., then, in '22 joined The Electric Controller & Mfg. Co., with whom he became head of the Research and Development Dept. In '36, he formed a consulting engineering firm and is now a registered professional engineer.

The second principle, cones—and belt, is the most widely used variable speed device producing stepless change of speeds. The greatest portion of the paper mills are driven today by this method. The speed range is limited to the product of the two ratios measuring the taper of the cone. If the ratio of the large diameter to the small diameter of the cone is two to one, the speed range obtainable with a device using two of these cones and belt is four to one. The torque increases as the diameter of the driven (output) cone increases and hence its speed decreases. Therefore the torque increase equals the ratio of the large to the small diameter of the cone. In the example just mentioned, the torque increases will be two to one, while the speed change is four to one.

The torque in this device is transmitted by means of a frictional engagement between the belt and the surface of the cone, therefore it is not a positive engagement, and slip is always present at shock loads and at overloads.

The third principle is the disc and roller. This device is much used in computing machines and is also known as a "ball integrator." It consists of a revolving disc whose surface is engaged in a rolling contact by a roller.

The axis of rotation of the roller is by necessity perpendicular to the axis of rotation of the disc and intersects it. The roller can slide along its axis and engage the disc at various distances from the center. The attractive feature of this device is the ease with which the speed of the roller



Variable speed transmissions, by the Reeves Pulley Co., Columbus, Ind., employ the expanding pulley—Vee belt principle, are infinitely variable and are manufactured in several types. Shown is the Reeves Reducer-Type Transmission, used to obtain extreme speed reductions or increases, and here applied to a toolroom shaper.

**Adapted from a paper presented at the A.S.T.E. New Era Exposition, Cleveland, Ohio.*

FIG. 1

Principle	*Speed*	*Range*	*Torque*	*T. Range*	*Engagement*	*Com. Value*
Gear Change	Stepped	Unlimited	Variable Inversely to Speed	Unlimited	Positive	Excellent
Cones and Belt	Stepless	Limited by Diameter of a Cone	Variable Inversely to Speed	Limited by Diameter of a Pulley	Friction	Excellent
Disc and Roller	Stepless	Unlimited	Constant	Limited by Diameter of a Roller	Friction	Fair
Variable Throw	Pulsating	Unlimited	Variable Inversely to Speed	Limited by Strength of Parts	Positive	None
Inertia	Pulsating	Unlimited	Variable Inversely to Speed	Limited by Strength of Parts	Positive	None

	Commercial Forms of the Cones—Belt Principle	Number of Manufacturers
1.	Variable Pitch Pulleys and Belt	Eleven
2.	Variable Pitch Pulleys anl Chain	One
3.	Steel Cones and a Steel Ring	One
4.	Steel Cones and a Steel Ring and a Gear Differential	One
5.	Variable Pitch Pulleys and a Chain and a Gear Differential	One

FIG. 2

can be carried, or the direction of rotation changed. Assuming that the disc is running at constant speed and the roller is being gradually moved from the periphery towards the center, the speed of the roller shaft will gradually decrease in proportion to the distance of the point of engagement from the center. As the center is reached the roller will cease to rotate, this point is called the zero speed and the direction of rotation of the roller will reverse as soon as it is moved on the other side of the center. This range of speed is called infinite.

Speed Range Clarified

Perhaps here is a good place for us to make sure that we all understand what we call the speed range. We define the speed range as being a ratio, or a number expressing a ratio, of the maximum to the minimum r.p.m. If the maximum r.p.m. is 400 and the minimum is 100 r.p.m.—the ratio of 400 to 100 which is four—is called the speed range. Obviously, if a device like the disc and roller is capable of zero speed as its minimum, the ratio will be then, say 500 r.p.m. to zero—which is infinity.

The torque of this device is determined and limited by the radius of the roller and the frictional force of engagement; both being constant, the torque does not change with speed.

There are two more principles capable of producing variable speeds. They are the variable-throw and the inertia type torque converters. At the beginning of the automotive era, there were numerous attempts made to produce a

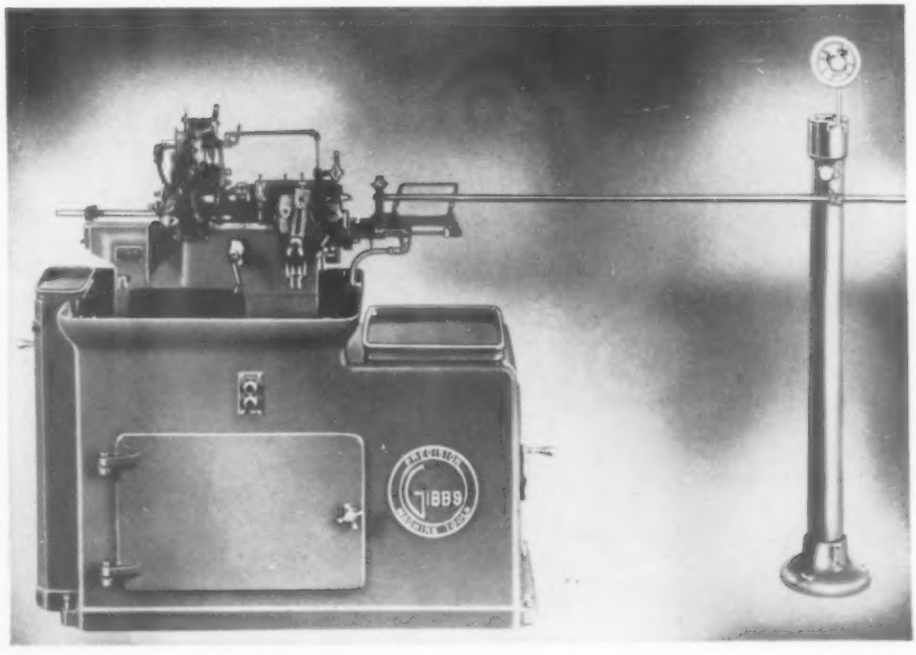
Number of Belts	Trade Name	Manufacturer	H.P. Rating	Speed Range
One	"Reeves"	Reeves Pulley Company, Columbus, Ind.	.4 to 87 .3 to 68 .25 to 53 1.12 to 49 1.4 to 15 3.2 to 14 10.8 to 13 18.3 to 12	2:1 4:1 6:1 8:1 10:1 12:1 14:1 16:1
One	"Lewellen"	Lewellen Manufacturing Co., Columbus, Ind.	.25 to 60 .25 to 40 .25 to 40 .15 to 35 .15 to 15 2.5 to 10 5 to 10 7.5	4:1 5:1 6:1 8:1 10:1 12:1 16:1 18:1
One	"Speed-Trol"	Sterling Electric Motors, Inc., Los Angeles, Calif.	.25 to 15 .25 to 15	3:1 6:1
One	"VariDrive"	U. S. Electric Motors, Inc., Los Angeles, Calif.	.25 to 10 .25 to 10	5:1 7:1
One to Three	"Vari-Pitch"	Allis Chalmers Company, Milwaukee, Wis.	1.3 to 8.4 6 to 33 7.2 to 75	3¾:1 3¼:1 3 :1

FIG. 3

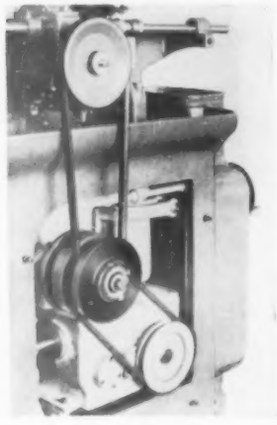
variable speed transmission based on one of these principles. Although these attempts produced no commercial transmission, the development of this type of device was not given up. During the last war, the Chrysler Corporation developed a device, used in aircraft, for driving at constant speed an A. C. generator from a variable speed source of power—the airplane engine. This device is based upon the variable-throw principle.

It is a remarkable fact that besides the gear change principle, *only the cones-and-belt* principle has produced commercial variable speed devices. The well-known variable pitch pulleys and V-belt is the obvious modification of the cones-and-belt principle. The variable pitch pulleys are also called expansion pulleys.

Fig. 2 shows the five types of variable speed transmissions available on the market, whose construction and performance depend upon the cones-and-belt principle or



The "Speedmaster," by the Do-All Company, Des Plaines, Ill., applied to a Gibbs Model 375 Automatic Lathe. A compact unit, easily installed, with a 6 to 1 speed ratio, it uses standard Vee belts with automatic alignment and a permanently mounted motor.



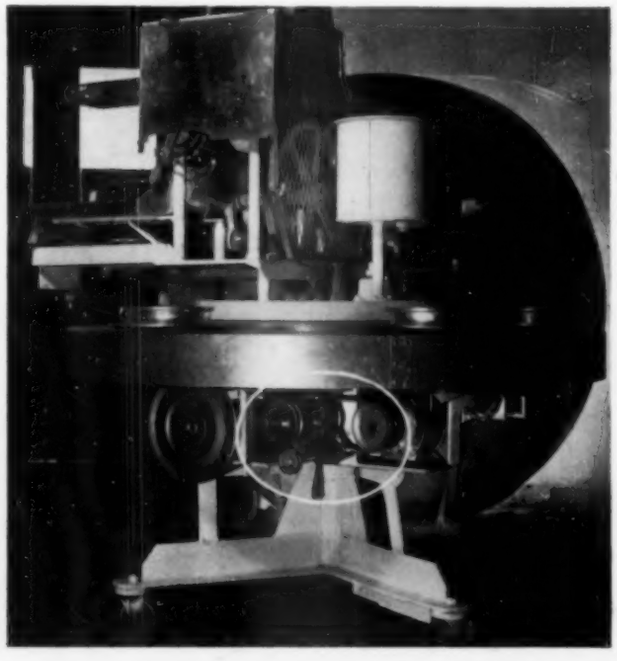
No. of Belts in Series	Trade Name	Manufacturer	H.P.	Speed Range
Two	"All-Speed"	Standard Transmission Equipment Co., Los Angeles, Calif.	⅛ 1½	6:1 6:1
One	"Power-matic"	Powermatic Machine Company, Los Angeles, Calif.	1 7½	4:1 3:1
Two	"Select-O-Speed"	Ideal Commutator Dresser Co., Sycamore, Ill.	⅛ 5	5:1 5:1
Two	"Toledo"	Toledo Timer Co., Toledo, Ohio	¼ 3	10:1 5:1
Two	"Worth-ington"	Worthington Pump & Machinery Co., Harrison, New Jersey	⅓ ¾	16:1 16:1
Two Three	"Speed-master"	Speedmaster Div'n, DoAll Company, Des Plaines, Ill.	.55 .70 .85 .55 .70 .85	5.4:1 6.4:1 6.7:1 12:1 12:1 12:1

FIG. 4

its modification. There are eleven manufacturers making and selling variable speed transmissions and devices consisting of the variable pitch pulleys and belt. There is one manufacturer making a transmission consisting of expansion pulleys, in the shape of radial grooved conical wheels, and a specially designed self-tooth pitching chain in place of the belt. This all-metal device is enclosed and runs in a pool of oil.

Another manufacturer is making a transmission consisting of four steel cones and a steel ring in place of a belt. This is also a totally enclosed device running in a pool of oil. Another is making a transmission of infinite speed range, consisting of a combination of steel cones and ring with a gear differential, and still another manufacturer recently put on the market an infinite speed range variable speed transmission consisting of a combination of the expansion pulleys and chain with one or more bevelled gear differentials.

The "JFS-JR" Variable Speed Transmission, by Standard Transmission Equipment Co., Los Angeles, applied to a pie filling machine. The drive synchronizes speed of filling with the consistency of the filling.



Trade Name	Manufacturer	H.P. Rating	Speed Range	Description
"P.I.V."	Link-Belt Company, Philadelphia, Pa.	.45 to 13.5 1.35 to 13.5	3:1 4:1 6:1	Variable Pitch Pulleys and a Special Design Chain
"Speed-ranger"	The Master Electric Co., Dayton, Ohio	1/6 to 3 1/6 to 3 ¼ to 3 ½ to 1½ ¾ to 1½	3:1 6:1 8:1 12:1 15:1	Steel Cones and Ring
"Graham"	Graham Transmission Co., Milwaukee, Wis.	1/15 to ¾	Infinite	Steel Cones, Ring and a Gear Differential
"Ohio-T"	Ohio Gear Company, Cleveland, Ohio	1 to 20	Infinite	"P.I.V." and Gear Differentials

FIG. 5

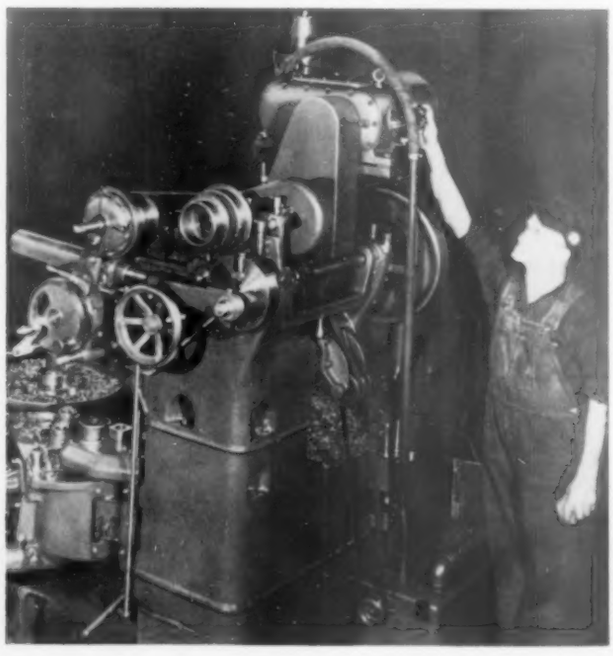
Fig. 3 shows a table containing a list of trade names, manufacturers, hp ratings, and speed ranges of transmissions available on the market, of the expansion pulleys and belt type.

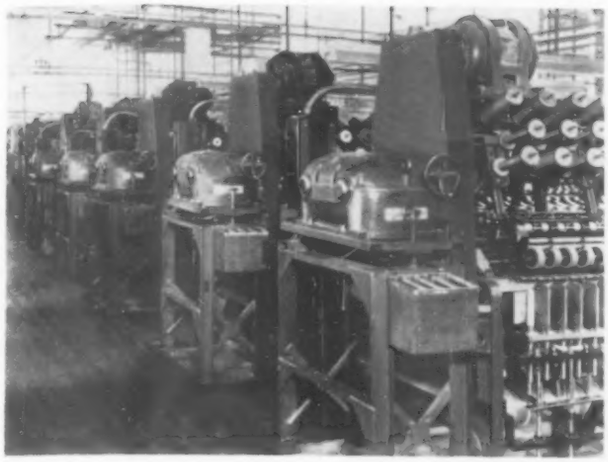
"Reeves" and "Lewellyn" are very similar machines, both available in many sizes from fractional hp up to 60 hp and more. The speed ranges are as great as 18 to 1. Both manufacturers are using a single V-shaped specially designed, wide belt. There are in use two types of belts—endless and spliced. The spliced belt is gaining in popularity over the endless because it is easier to replace.

The next two variable speed drives are the "Speed-Trol" and the "VariDrive." They are the motorized variable pitch pulleys and belt drives. The V-belts are of the conventional molded type, and only one is used. The "Speed-Trol" is available from one-quarter to 15 hp ratings and 6:1 speed range, and the "VariDrive" from one-quarter to 10 hp and 7:1 speed range.

The "Vari-Pitch" transmission is also of the expansion pulleys and belt type, but it differs from the preceding machines in the respect that it is the only machine on the market that uses more than one belt in parallel in order to carry more power. The belts used are of the conventional

"P.I.V." gear changer, by the Link-Belt Company, installed on a Fellows gear shaper. With this variable speed changer, infinitesimal speed changes are obtainable to suit the metal being worked.





"Vari-Pitch" Speed Changers, by Allis-Chalmers Mfg. Co., Milwaukee, used on spinning frames at the Caron Spurring Co., Rochelle, Ill.

A 2-pulley "Toledo" Variable Speed Transmission, by the Toledo Timer Co., Toledo, Ohio, as here shown intermediately mounted between the driving motor and a small bench shaper.

molded type and are endless. These transmissions are available from one to 75 hp with various speed ranges, maximum of which is $3\frac{3}{4}$ to 1. The multiple belt type of construction made possible a design which is more compact than any design of the single belt type. On the other hand, the speed range of the multiple belt type transmission does not possess the speed range that the single belt type does.

Fig. 4 gives the list of manufacturers making chiefly the fractional hp variable speed devices, all but one using two or more belts connected in series. As a rule, the parallel connections of belts increases the horsepower rating of the transmission, while the series connection increases the speed range. One of the three belt models of the "Speedmaster" is capable of delivering 34:1 speed range. Of course, the HP rating of this model is less than that indicated in the table. "Powermatic," "Select-O-Speed" and "Toledo" have hp ratings $7\frac{1}{2}$, 5 and 3 respectively.

Fig. 5 gives information on variable speed devices whose construction radically deviates from those so-far discussed.

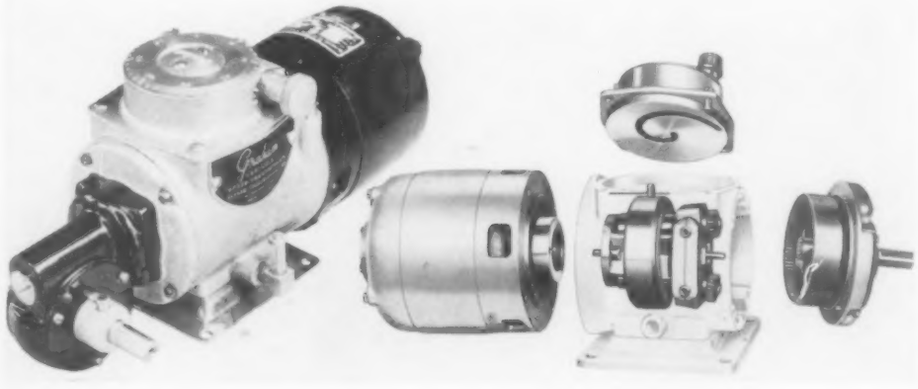
Slip Is Negligible

The manufacturer claims that the "P.I.V."—which stands for positive, infinitely variable—was the first and is the only speed changing mechanism to employ a positive chain drive to transmit the variable speed power. Quite often the question is asked "*How positive is such a drive? Is there any slip at all?*" The following will answer these questions:

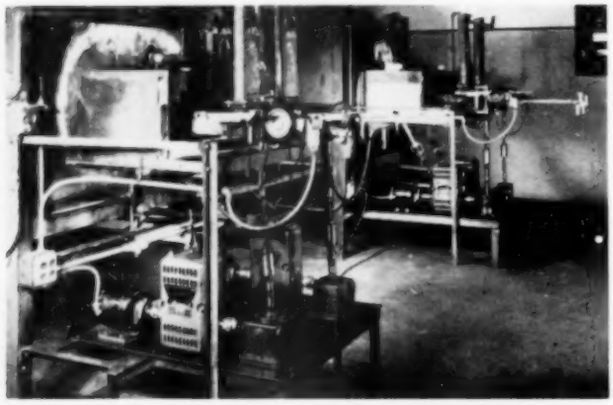
In the application for photogravure printing, constancy of speed ratio is extremely important; therefore measurements were made of input and output speeds of a "P.I.V." used in this case. It was found that there was slip of one inch in

The "Ideal" Variable Speed Pulley, as applied to a tapping machine. Permits infinitely variable control of work speed between 15 and 54 cycles per minute.

The "Ideal" Select-O-Speed transmission, by the Ideal Commutator Dresser Co., Sycamore, Ill.



The "Graham" Variable Speed Drive, by Graham Transmissions, Inc., Milwaukee, is an all-metal, planetary friction drive unit built as a straight line extension of an induction motor. HP ratings 1/15 to $\frac{3}{4}$, with infinite speed variations and reverse.



"Worthington" Allspeed Selector Model, by Worthington Pump and Machinery Corp'n, used to control speed of powder metal parts traveling on a conveyor through sintering furnaces. Photo taken at American Electric Metal Corp'n, Yonkers, New York.

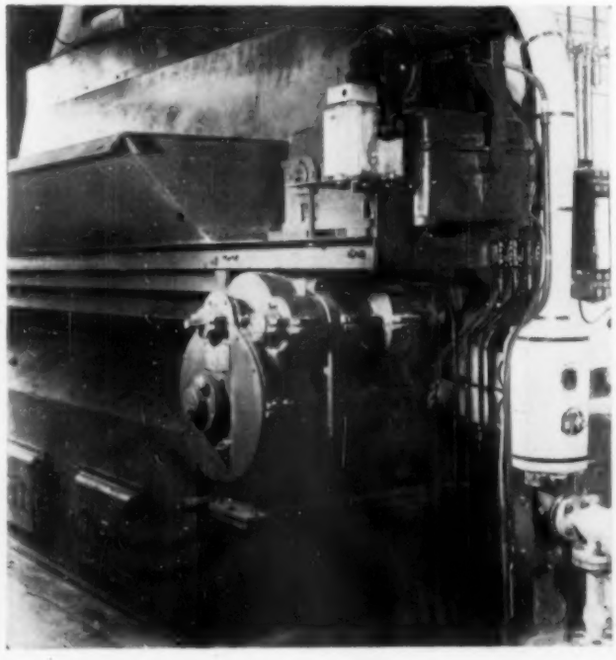
six-thousands, which is negligible from the practical point of view. As the table shows, "P.I.V."'s are made from a half to about 14 HP, with speed ranges from 3:1 to 6:1. Since this device is radically different from the belt type it will be interesting to compare them.

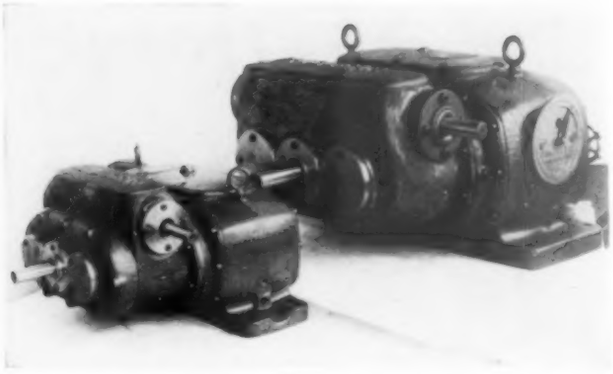
Among the advantages of the "P.I.V." the following features may be counted: compactness, absence of slip, all-metal mechanism totally enclosed and running in a pool of oil. Among the disadvantages we can mention the following: higher cost, limited speed range and slightly noisier operation.

Infinite Speed Ranges

The next variable speed device is the "Speedranger." This device transmits its torque through a frictional contact between the surfaces of a steel cone and a steel ring. A steel ring, in this case, performs the function of the belt or chain. The "Speedranger" is available in a variety of hp ratings from 1/16 to 3 hp, and in a variety of speed ranges, maximum of which is as high as 15:1. Among the outstanding features

The "Lewellen" fully enclosed Variable Speed Transmission, by the Lewellen Manufacturing Company, Columbus, Indiana, applied to automatic stoker control. Speed is varied through a lever control and is operated by the steam boiler pressure.





The "Ohio-T," by the Ohio Gear Co., Cleveland, Ohio. With infinite speed range and rating from 1 to 20 HP, this transmission is applicable to a wide range of uses.

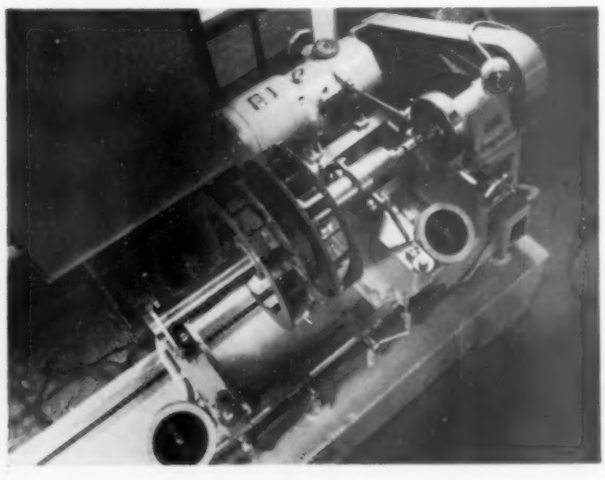
of the "Speedranger" are: in all applications free from mechanical shocks and where the higher initial cost is justifiable, this drive may be one of the best choices.

The next two transmissions, the "Graham" and the "Ohio-T," are in a class by themselves because their speed range is infinite. This means that these transmissions produce any speed whatsoever between the maximum specified and zero. They are also made to produce speeds from a specified maximum forward through zero to a specified maximum speed in reverse.

The "Graham" design is based upon a combination of two principles: One is the cones-and-ring, and the other is the gear differential. The torque is transmitted by means of a frictional contact between the surfaces of a steel cone and a steel ring. Grahams are available from 1/15 to 3/4 hp. Among the advantages are: an infinite speed range, great degree of compactness and reasonable cost. The considerable sensitivity to shock loads, of course, must be taken into consideration.

The design of the "Ohio-T" transmission is a combination of a commercial model of "P.I.V." with one, or two, bevel gear differentials. Therefore the torque is transmitted by means of a positive engagement of a toothed chain with the grooves of a coned wheel. These transmissions are available from 1 to 20 hp. The advantages are: infinite speed range, compactness and absence of slip. Among the disadvantages may be mentioned higher cost and slightly noisier operation.

"Speedranger" by the Master Electric Company, Dayton, Ohio, driving a dynamic balancing machine. This unit is equipped with manual remote control.



By **Fred M. Burt**

From Oil Well to Tires in Six Days

Synthetics Shorten the Gap from Source of Raw Material to Factory

A LARGE PROPORTION of the rubber, used in the production of tires in the Los Angeles plant of the U. S. Rubber Company, is a California product. While some crude rubber is used, the most is synthetic and produced in the Los Angeles area. At one end, oil is pumped out of the ground, and from the other end comes thousands of passenger and truck tires, ready for use.

Mr. Burt

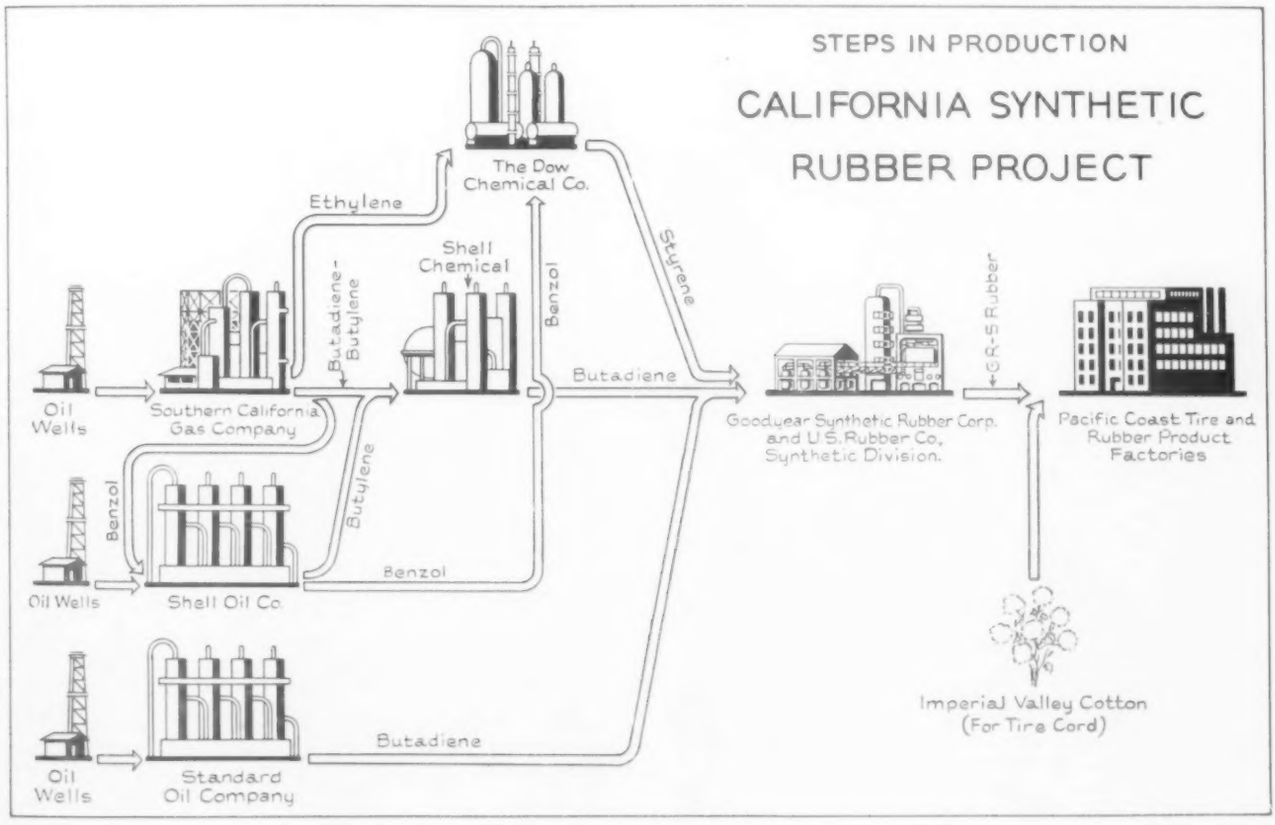
Buna-S—or GR-S (Government Rubber-Styrene Type) as it is called—is produced by the polymerization process in a factory some miles south of the tire plant, down among the oil wells. (See diagram, "California Synthetic Rubber Project"). The operation of this rubber-making unit has been taken over by U. S. Rubber chemists and engineers.

Allowing time out for transport and storage of materials, the actual process of converting petroleum into butadiene, thence into synthetic rubber and through the tire factory, adds up to only six days. The two ingredients—butadiene and styrene—are fed into reactors (Fig. 1.) where chemical action combines them into a synthetic latex. This latex then goes into the coagulation unit where it forms into rubber crumbs, Fig. 2. Conveyor belts pass the rubber crumbs through a disintegrator and drier and then the resultant end product is baled into solid, 75-pound loaves.

Main entrance of U. S. Rubber Co. plant, Los Angeles, Calif.

Close to the large raw material storage areas, in the tire plant, the 75-pound bales of raw rubber are fed automatically into a machine in which a large, hydraulic pressure ram forces the bale through a cutting die, in a horizontal plane, where it is chopped into six "pie cuts." A steel slat conveyor catches these cuts and carries them up a slight incline to be charged into a plasticator.

This machine operates somewhat on the principal of a meat grinder, extruding the rubber through a die in an endless strip. This strip passes on through a water-cooling bath, an agitated soap-stone bath, and then up through a rotary device where a knife chops the ribbon into standard



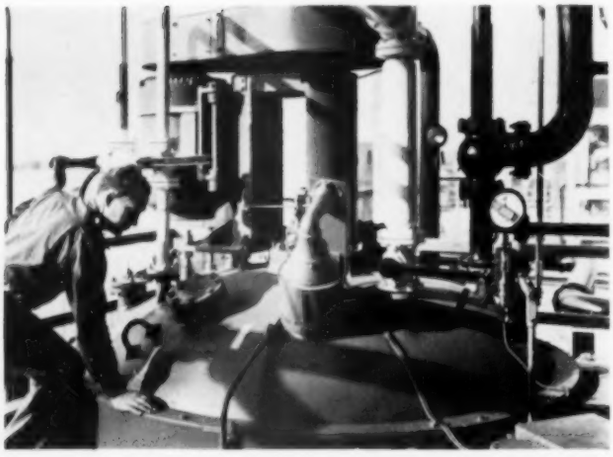


FIG. 1. View of one of twenty-four reactor tanks. Within these tanks the reaction process occurs whereby the two main ingredients of GR-S rubber, Butadiene and Styrene are hooked together in a process known as polymerization to make the synthetic rubber.

length slabs. These slabs are hung on L-shaped arms hung from an endless, overhead chain conveyor, for drying and cooling, or for a re-run through the plasticator, and then for a final cooling and drying. They are then placed on special floor trucks for movement, via elevator, to Banbury mixers.

Including the various types of raw rubber, there are 242 chemicals, used variously in the Banbury mixers, to provide rubber with the proper characteristics for a wide diversity of uses, not only for tires, but also for all sorts of mechanical rubber goods. Among the major items are carbon black, sulphur, rosin and zinc oxide. The proper additive mixes are made in this storage plasticator area, and placed in truck compartments for transportation to the Banbury mixers (up three levels) where they meet the raw rubber slabs, also to be charged. A conveyor carries the slabs from trucks to mixer and—conveniently close—to weighing equipment used to assure proper portions of other ingredients.

FIG. 3. Rubber from Banbury mixer (above) being milled and kneaded in a rubber mill.

FIG. 2. Synthetic rubber latex, made by combining Butadiene and Styrene, is here coagulated to form rubber crumbs. Washed and dried, the crumbs are pressed into 75 lb. bales, ready for tire building.

As the rubber and other ingredients pass down through the Banbury mixers (of which there are six with more being installed to handle increased post-war production) they are mixed homogenously, and then the resultant batch drops down to the mills on the lowest (main) floor level. Here, the rubber is milled and kneaded by water-cooled, steel rolls into pliable sheets. See Fig. 3. After this milling, the rubber is fed in a narrow ribbon across to another mill for further working.

From here, it is fed into an automatic slab-off machine, through a soap-stone bath, and is again cut into 3' slabs and automatically hung on the arms of another overhead, cooling and drying conveyor. From this conveyor, the slabs are stacked on skids for transportation to the subsequent points of use. Different rubbers are used for coating fabrics to make up tire cords, while other rubber combinations are used for treads and for side walls.

FIG. 4. Cotton string, from spindles in the creel, passing into latex coating machine.

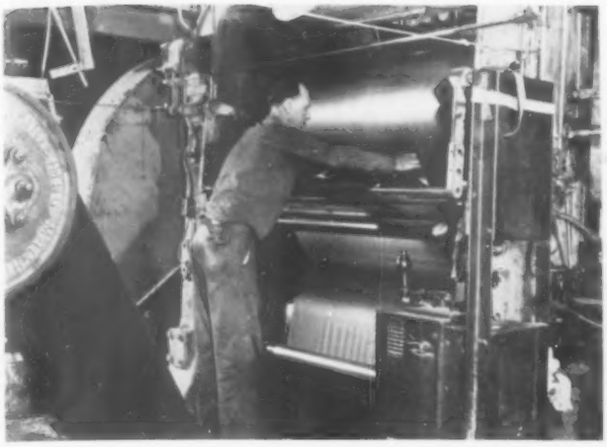


FIG. 5. Coating both sides of tire fabric with rubber in a calender.

In the Web Fabric Department, in the meantime, hundreds of spools of cotton cords are mounted on spindles to feed through a comb into a machine that coats the fabric with latex. The operation holds the cords taut and tightly together in parallel and single thickness. See Fig. 4. The bath is agitated as the cord passes through it, the latex coating holding the cords together to form a solid sheet. This sheet then passes slowly around five 9′ diameter, steam-heated, revolving drums for drying, and then around a series of 16 superheated, smaller drums, after which it is collected in a roll. These rolls weigh about a ton. The fabric is made up in widths from 34″ to 57″, mostly 55″.

The fabric is taken to a calender, where it is coated on both sides with the proper type of rubber for the use for which it is intended. See Fig. 5. The rubber is fed down to the calender rolls on a short roller conveyor which oscillates back and forth so that the rubber may be fed evenly the full width of the rolls. The rubber passes continuously through the machine to be coated on to the fabric.

FIG. 7. Applying tire plies on tire-building machine.

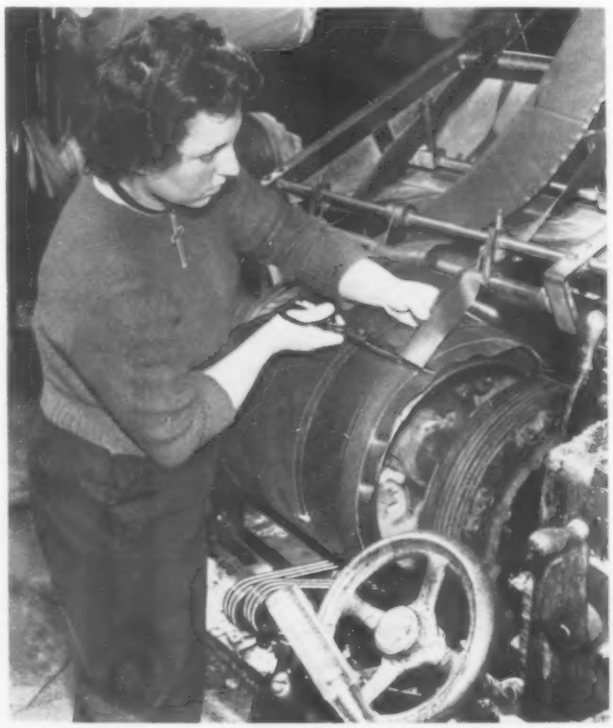


FIG. 6. Automatic cutting, of impregnated and coated tire fabric, into strips of specific size and shape.

The calender is a double machine, with rubber from the first set of rolls coating one side of the fabric. The second set of rolls coats the other side. The calender "train" then runs through the cementing machine to receive application of cement on both sides. This makes the coated fabric more "tacky." It is then rolled up in an interliner in which all cemented surfaces are kept separate by the cloth interliner. These rolls then go into storage in areas, designated and marked for each type, until further work is to be done on them.

Extrusion Process Used

The fabric is cut into a variety of widths and lengths, often with the ends of the short pieces lightly cemented together, and re-rolled in a variety of widths. Several machines and methods are used, that there may be a supply of fabric strips of every needed size, shape, and material available, for the tire builders, in servicers from which they can take the desired strips in the most convenient manner. See Fig. 6.

Rubber for treads and sidewalls, in slab form, is fed into mills for further working and forming into long feeding ribbons. One line of this rubber, for the tread, and another for the sidewalls, feed continuously into a tubing machine —i.e. a tread tuber. The sidewall rubber splits into two in the tuber, and is extruded through two narrow, outer slots in a die, with the tread rubber being extruded through a wider slot which is between the other two, joining them.

This forms a continuous belt with the sidewalls on the outsides, and the thicker tread in the center, joining the sidewall widths. This belt passes through a long, water-cooling bath, in a horizontal plane. At the end of the line, it passes over a roll and back, with the previous bottom side now up. Just past the roll, in the return travel, the belt receives a cement bath and then passes through a hot air dryer.

At an earlier point in the travel, a marking roll, set for proper spacing, imprints the tire size, type and code number. Past the hot air dryer, as the belt continues on its reverse travel above the other line, it is sliced into standard lengths with the cutting guided by the automatic marking. Traveling a little further on the roller conveyor, the cut strips are removed and placed on tread tray trucks 6′ high. These have propecting leaves, hinged on the inner edges, and provided with spring attachments to hold them in position.

Tire beads are made from steel wire, with the individual wires coated with rubber while passing through a die, and

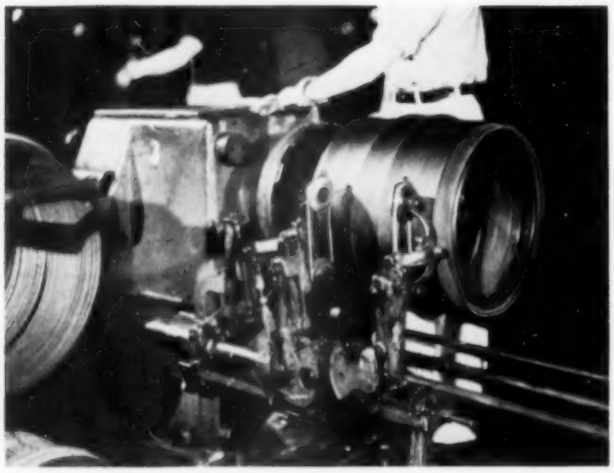


FIG. 8. Thread and sidewall being stitched or rolled down on tire-building machine.

FIG. 9. Vacuum-box shaper receiving tire carcass after insertion of steam-curing tube. After top is clamped down and vacuum created, the carcass will assume rough tire shape.

then wound up in bundles of the correct size. Next, on a wrapping machine, the bead is wrapped with rubber-coated, fabric stock. Then in another machine, flippers are applied to the bead. Two leaves of calender stock extend a few inches from the bead, with the center portion wrapped around the bead. These leaves extend from the bead, to be tied into the tire plies as the tire is built.

Using a passenger tire as an example, the tire builder expands a collapsible steel drum into cylinder form. As it revolves, he applies the first and second plies. This fabric comes off a festoon. This is a holding device containing a long series of these cut pieces of fabric (cut to exactly proper size for this tire) lightly cemented together at the ends, one to another, so they may easily be pulled loose for use. See Fig. 7.

The plies are then rolled down, followed by the application of beads from each side, with the first tuck-under of one flipper of the bead to lock it to the plies. Then, plies three and four are applied and rolled down, after which chafer and breaker strips are applied and rolled down with the third and fourth plies.

Molding and Curing

The tread-sidewall strip is centered up and applied, then rolled. See Fig. 8. Lastly, the final tuck-under is made, folding the third and fourth plies the opposite way around the bead. The builder's number and the tire size is stamped on, the drum is collapsed, and the tire is removed and placed on a hook of a nearby overhead conveyor line. This conveyor carries the tires from several tire-builders past an automatic counter, and then to a table where each tire is removed, inspected, weighed and replaced on the same line to be carried on through a steel tunnel in which dry soapstone is sprayed on. They are then removed and stored on special racks.

Next, the cylindrical-shaped tire carcass is placed in a vacuum-box shaper, to give it a rough, tire shape. See Fig. 9. The tire is placed in it, soaped inside and then the steam curing-tube, (a water bag that looks like an inner tube), is pushed down inside the tire body by a vertically-descending pneumatic pusher. The resultant vacuum, after the clamping-down of the top, pulls the tire into the desired shape. The tire is then removed and carried away on an overhead conveyor with the tube still in it.

At a station, on the curing line conveyor, the tire is placed in the lower section of a mold. As these loaded mold sections move along, lying on the conveyor, the upper portion of the mold meets the lower section, descending on an overhead conveyor. The two parts of the mold are joined and pass on to the curing pit in which there are 20 rams to receive the molds. The steam-curing tube is attached to a steam line, when the ram carrying the mold drops down into the curing-pit and the lid is placed on the top of the pit so that a constant steam heat may be maintained for 40-50 minutes to cure the tire and allow it to conform to the mold. This gives the tire its final shape. Each unit has its own adjacent clocks and gages used to maintain the exact time-temperature control.

After completion of the curing, the ram rises, the mold case is removed and travels on the conveyor to a station where the top section is loosened by an opener operating on the principal of a pneumatic jack. Then, as the mold moves on to another station, the overhead conveyor, carrying hooks to which the upper part of the mold is attached, drops down, and lifts and carries it away to where it will be used

FIG. 10. Rough cutting tire mold to shape on a King boring mill.

FIG. 11. Forming truck tire half section mold in Breitenstein engraving machine.

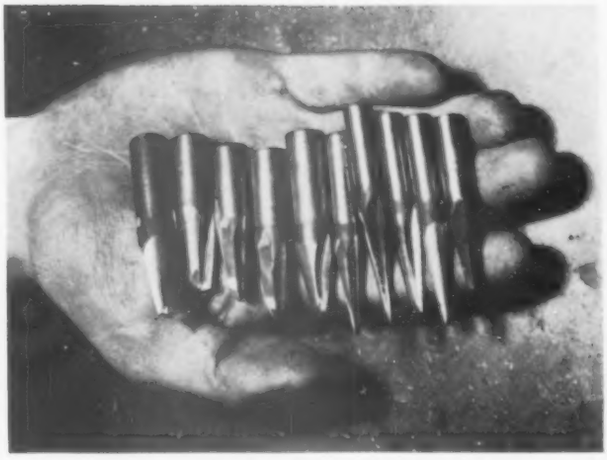


FIG. 12. Cutting points used to form tire mold on Breitenstein engraving machine.

again in the same manner. The whole operation is continuous and synchronized.

Moving a little farther along, the tire is loosened manually from the lower section of the mold, passes upwards on a roller conveyor while the mold section continues on its conveyor, and joins the upper section for re-use. This completes the entire cycle of operation.

The tire is carried to a machine where it is placed in a jig, nearly upright. Here, a descending ram distorts it and makes it easy to remove the steam-curing tube. A conveyor carries these tubes back for re-use while the tire passes through a painting machine which sprays a black coating on the outside. It then moves on rollers past a brush that smoothes out the paint. Another overhead conveyor then carries the tire to the inspection section.

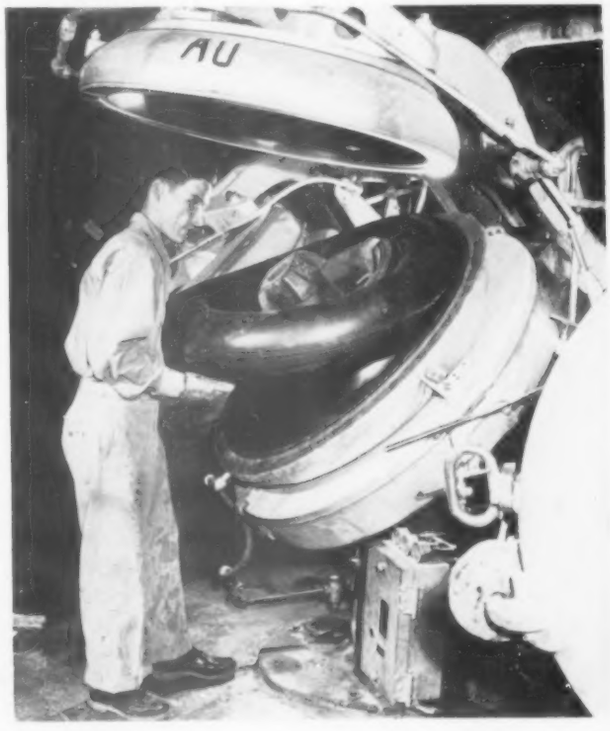
Here the tires are sorted into size, type and ply. The little projecting teats and parting-line strips (if any) are removed with a V-shaped knife. Next, they are placed on a balancing machine which has four bearing points. This automatically indicates the light side, on which a red dot is imprinted. Tires are then inspected carefully inside and out. After further checking and labeling they go to the warehouse.

Truck tires, up to the heavy duty, 14 ply, 12.00 x 18 size, are built up and cured in individual curing molds. Curing time of truck tires ranges from one to three hours. Similar —but double—units are also used to supplement passenger car tire production. All of these individual units are thoroughly serviced by overhead tramrails, cranes and hoists.

The molds used in tire-making are produced in the company's machine shop. The rough castings, purchased from outside sources, are produced to the company's specifications. On delivery, four holes for lifting pins are drilled in the perimeter, 90 degrees apart and $1\frac{1}{2}$" deep. A radial drill press is used. They are then carried to a 60" King boring mill for rough-cutting to shape, on the inside, and backing

FIG. 13. Hand finishing truck tire mold with a polishing tool.

FIG. 14. New Butyl synthetic rubber tube comes from "watch-case" heater at U. S. Rubber Co.



off for thickness and parallel surface, on the other side. See Fig. 10.

Two identical units are machined to form upper and lower sections of the mold case. The non-skid design is machined on a Breitenstein engraving machine. See. Fig. 11. Using a variety of cutting tips for different angles, lengths, and diameters of cuts (Fig. 12) the design of the outside of the tire half-section is machined out to the exact dimensions shown on the guiding blueprint.

The final finishing of the mold is effected by fine, careful hand work. The surfaces must be smoothed down while staying within four or five thousandths of an inch of precise dimensional limits. By hand chipping, with a straight chisel and air hammer, the side wall ribs are rounded. A rotary power file removes the chisel marks, while an air hammer peening tool hammers out tool marks. The final polishing is done with rubber discs and other buffers on an electric, flexible shaft grinder.

Some of the work on these molds is done by ex-servicemen working and learning under the education provisions of the G. I. Bill of Rights. See Fig. 13. Lettering, numbering and insignia to be molded on the surface of the tire is provided by stamping the same on the inner surface of the mold. These are engraved on the heads of various mold stamps and impressed on the mold with a hammer blow.

The manufacture of tubes is much more simple than that of tires. The rubber stock is kneaded in a mill and continuously fed into a tuber from which an endless tube is extruded. This travels through a cooling bath and a soapstone bath. As it travels, a contacting crayon marks it for the entire length with the color (blue for Butyl) of the material. Names are imprinted automatically as an electric eye guides dimensional marking for length. Cutting-off, to proper length, is also automatic. Valves are inserted and attached, and the end spliced on an automatic splicer, after which the tubes are placed on racks preparatory to being cured.

This curing is done in "watch-case" heaters, shown in Fig. 14. These operate automatically, after the inflated tube is inserted, are under close time/temperature control and open automatically at precisely the proper moment. After curing and cooling, each tube is inflated and inspected in a water bath for air holes. It is then deflated and inspected for possible defects, and sent through a long, continuous, tubular hot air dryer. Then comes the final inspection, boxing and crating.

Improved Cutting Oils by Texaco

DEVELOPMENT OF A NEW series of pale, transparent cutting oils, of pleasant odor and non-corrosive, for use in high-temperature machining of metals, has been announced by The Texas Company. To be marketed as Cleartex Cutting Oils, A, A-1, B, DD and Britex Cutting Oil B, these products now contain heretofore war restricted ingredients said to greatly improve their performance.

All oils in the series contain a combination of sulphur and chlorine, permitting high cutting speeds without corrosion of metals. Addition of the new ingredients makes possible even higher speeds in machining without the danger of corroding finished or semifinished metals, particularly non-ferrous metals such as brass and copper. In color, the new oils equal pale neutral oils of the same viscosity, with characteristics improved to permit higher cutting speed, longer tool life and better surface finish.

A·S·T·E· *Productioneers*

YOUR CENTRAL OFFICE STAFF

One of the most important cogs in the ASTE Central Office machine is Edythe Reichart, Secretary to the National Membership Committee.

It is Edythe's job to attend to all details concerned with Society membership. A recently added responsibility involves maintaining the records of all ASTE members in and being discharged from the Services. Her work also includes the removal of members deceased or resigned, processing new memberships and rendering myriad services to existing members.

Mrs. Reichart reports that her department now processes an average of more than twelve new members each day. Every new member added to the ASTE roll requires a dozen separate operations in order that the candidate may receive all of the services offered by the Society.

As this issue of *The Tool Engineer* goes to press, there are 1124 ASTE members still in the Armed Forces. As these men are discharged, Mrs. Reichart reinstates them to regular membership in their respective Chapters. While they are in Service, she sees that they receive all important Society literature and communications.

Edythe's special attention to servicemen no doubt springs from the fact that she joined the ranks of ASTE as a "war widow" three years ago. One of the Society's older employees from the standpoint of service, she started in the Address Change Division in 1943 and was subsequently promoted to the Program Division. The background and knowledge gained in these Divisions, coupled with her efficiency and pleasant personality, qualifies her well for her present position.

Now that her "better half" has returned from the Navy, Edythe and her handsome sailor have settled in a cozy apartment where she collects odd china cups and saucers in her spare time. She has also a notable collection of china kittens.

Born in Wardner, Idaho, the home town of another beauty, Lana Turner, Mrs. Reichart likes to cook—especially Idaho potatoes—but does not relish other forms of domestic exercise.

Most of her schooling was acquired in Detroit where she graduated from Northern High School and Detroit Business Institute. Edythe came to ASTE with five years of sound business experience, three years of which were spent as Branch Manager of Doty Discount Corp., Detroit.

Mrs. Reichart personifies the ASTE spirit of hard, efficient work, good nature and engaging personality.

By **Frank D. Sanborn**

Donate Surplus Machine Tools to Schools

Technical Education and a Healthy Machine Tool Industry Held Essential to Material Progress

IT HAS BEEN adequately proven that this nation's security and welfare, both in war and in peace, depends to a great extent on its engineers. In order to maintain its leadership among nations, America must make every effort to make up, as far as possible, for almost complete standstill in engineering and vocational training during the war years.

This can only be done by our government helping schools of all levels to obtain equipment absolutely necessary to quickly train a sufficient number of men and women. And, since our government has, at the present time, more desirable surplus property than it can dispose of under existing regulations—the Surplus Property Act of 1944 gives schools priority to this vitally needed equipment—what must be done is obvious. And millions of returning veterans, wishing to continue their education, *hope it will be done soon.*

In the fall of 1945, the Fellows Gear Shaper Company of Springfield, Vermont, decided that the schools of the United States were entitled, by the present law, to receive government surplus machine tools. The price to be paid, for this equipment, would not exceed the crating and transportation charges or a nominal rental or lease charge. These convictions have been supported by much vigorous, nation-wide action and, although the battle is not won, definite progress has been made.

Schools Need Modern Machines

In common with many other machine tool builders, this company contends that the national economy and security depends to an important degree on a healthy machine tool industry hampered as little as possible in its sale of new machines. It is further contended that it is vitally important to our national well-being that all schools be allowed to obtain, by donation, the necessary amount of surplus equipment to fulfill their legitimate needs.

Before continuing with this progress report, and in order that the reader may more properly evaluate the rights of educational institutions under the original Surplus Property Act of 1944, we quote the following excerpts:

"Sec. 13. *Disposal to Local Governments and Non-Profit Institutions* (a) The Board shall prescribe regulations for the disposition of surplus property to States and their political subdivisions and instrumentalities, and to tax-supported and non-profit institutions, and shall determine on the basis of need what transfers shall be made. In formulating such regulations, the Board shall be guided by the objectives of this Act and shall give effect to the following policies to the extent feasible and in the public interest.

"(1) (a) Surplus property that is appropriate for school, classroom, or other educational use may be sold or leased to the States and their political subdivisions and instrumentalities, and tax-supported educational institutions, and to other non-profit educational institutions which have been held exempt from taxation under Section 101 (6) of the Internal Revenue Code. *(Sub-paragraph (b), of the Surplus Property Act of 1944, referred only to medical supplies and equipment, and is hereby omitted.*—The Editors.)

"(c) In fixing the sale or lease value of property to be disposed of under sub-paragraph (a) and sub-paragraph (b) of this paragraph, the board shall take into consideration any benefit which has accrued or may accrue to the United States from the use of such property by any such State, political division, instrumentality or institution.

"(2) Surplus property shall be disposed of so as to afford public and governmental institutions, non-profit or tax-supported educational institutions, charitable and eleemosynary institutions, States, their political subdivisions and instrumentalities, and volunteer fire companies, an opportunity to fulfill in the public interest their legitimate needs.

"(f) The disposal of surplus property under this section to States and political subdivisions and instrumentalities thereof (educational institutions) shall be given priority over all other disposals of property provided for in this Act except transfers under Section 12 (Transfers to Federal Agencies)."

Frank D. Sanborn **was graduated from Northeastern University with degree B.M.E. After a brief term of service with the Fellows Gear Shaper Co., Springfield, Vt., he transferred to the midwest automotive field. Returning to Fellows in '38, he has since served as field engineer in the Detroit area. He has staunchly advocated diversion of war surplus machine tools to America's educational institutions.**

A canvass of 128 educational institutions, made last fall, revealed that over 75 per cent either were not familiar with the procedure for obtaining donated equipment, or had given up after a few futile attempts to obtain it. To each of the 128 schools, Fellows field men explained the proper procedure, advised the proper equipment for each school visited and obtained a list of the machine tools and inspection equipment that each needed to replace obsolete equipment, originally obtained after World War I, and to enlarge its facilities to meet the greatly increased student demands for mechanical education.

The Surplus Property Administration (now known as the War Assets Administration), has ever since the end of the war opposed the donating of machines to schools. There has been set up a series of regulations which, although claimed as beneficial to schools, really prevent the vast majority from obtaining other than wornout and obsolete equipment. These regulations, taken in the order in which they were put into force, are:

(1) SPA Regulation No. 14, dated November 6, 1945, which establishes a discount of 40% beyond the normal market price to educational institutions.

The discount given is helpful only as regards supplies which schools are constantly buying anyway and which, therefore, are included in their normal budgets. Such a

All opinions expressed in this thought-provoking article are the author's, and are not to be considered the official viewpoint of the A.S.T.E. *The Editors*

discount means nothing as regards machinery or such items as may be considered capital equipment. The remaining price, after discount, is still far too high. A gear cutting machine at $3,000 may be a bargain to a manufacturer, but not to a school which does not have $3,000, yet needs the equipment.

(2) SPA Regulation 19, issued December 7, 1945, makes it illegal for a disposal agency to donate a machine tool to a school as long as it can be sold as scrap. Machines that are in great surplus, that have educational value and that have been offered to industry at the Clayton formula level without sale, cannot therefore be reappraised to fair values which would make it possible for schools to buy them.

According to SPA Regulation 19, that machine must be scrapped. Under this ruling, the scrap dealer has a better priority than educational institutions which can only hope to buy surplus tools by raising a lot of money. Hence, the scrap dealer is well taken care of, at any price he chooses to offer, while the schools go without.

600,000 Surplus Machines

Furthermore, it is estimated that if all eligible schools were allowed to obtain necessary machine tools, the total would only be approximately 100,000 units. On January 15, 1946, Mr. Symington (then Surplus Property Administrator) advised the Metal-Working Equipment Industry Advisory Committee in Washington that an estimated total of 600,000 machine tools would be declared surplus in one and one-half years.

He further reported that there were on hand (in warehouses and open fields) 100,000 units and that about 40,000 had been disposed of so far. From these official figures, it can be seen that even if the schools were supplied with all the tools needed, there would still be more than enough to supply the rapidly diminishing reconversion needs of industry.

Now, what arguments are advanced for government refusal to donate machines to schools? Based on what is believed to be well known facts, it can be said that the reluctance of the government to donate needed machine tools to schools, at a cost of crating and transportation, is predicated on three misleading and/or false premises. These are:

(1) That the sale of these machines, at Clayton formula prices, will enable the taxpayer to recapture a substantial portion of his investment. The contention is that this cannot be done by donating to anyone.

(2) All the surplus tools, either in storage or yet to be declared, will be necessary for reconversion purposes if industry is to quickly provide "jobs for all." The contention, here, has been that the national economy and security would be periled by industry having to wait several months for new machines from the builders, with attendant loss of income and taxes.

(3) All surplus machine tools not needed for domestic reconversion use can be sold to foreign governments, who will use them for their own reconversion purposes. This will eliminate the necessity of WAA (War Assets Administration) storing them for a long period, selling for scrap, or *donating*.

Let us subject these three arguments to critical examination. The *first premise* is very misleading, for although it would seem to be economically sound, the sale of this equipment under present conditions will actually return very little if any money to the taxpayer.

It was disclosed, in a recent interview with Army officials, that before a large plant could be cleared, an inventory must be taken which might require 5,000 people working six months. In other words, it would cost the taxpayers approximately $9,000,000 to complete that inventory alone. This should convey some idea of how serious the surplus "surplus" is getting to be.

Together with the other items already mentioned, "approved dealers" in machine surplus are paid a 12½% commission on the selling price. To all this, add insurance and depreciation, and it becomes readily apparent that, with the selling price averaging about fifty cents on the dollar, the *taxpayer is lucky to recapture anything*.

In view of these things, Fellows declares the first premise *false* and *misleading*. It is a poor excuse for not donating to schools, all the WAA equipment needed at a cost not to exceed crating and transportation. Unless a regulation making these donations possible is quickly put into force, hundreds of costly precision machines, needed by schools, will have deteriorated to *scrap condition*. Taxpayers' money cannot be recaptured with scrap dollars!

The *second premise* (regarding the use of these machines for reconversion) is also misleading in that its contentions, although applicable directly after the war ended, are no longer valid. War's end found the large companies—and many of the smaller—well supplied with government-owned equipment which, to a considerable extent, was needed as a stop-gap for their peacetime production. This equipment was retained under contractor's rights and, where additional equipment was needed immediately, such was obtained from the then RFC surplus.

In the majority of cases, the only reason why used surplus machinery was purchased from RFC was because certain companies felt that they could not wait several months for new machines. The desire to reconvert quickly was motivated by a desire to get into profitable peacetime production quickly so as to discharge a responsibility to the employees and to the national well-being in general.

New Machines Now Available

By now, however, machine tool builders are generally in a position to offer delivery on new machines, of similar types to those held in government surplus, in less than thirty days—and that means completely tooled for the job! It follows that, within a short time—or as soon as manufacturers obtain new machines with which to replace old models—another huge "industrial surplus" of machines will automatically be thrown on the market to compete with those now in WAA warehouses. Therefore, the only future possibilities, exclusive of schools, for disposing of this "double-decker" machine tool surplus is the small shop owner, who may not be in a position to buy new models, and the second-hand or scrap dealers. This "market" promises very little relief.

On the basis of what appears to be irrefutable facts, then, the Fellows Gear Shaper Company believes that it has logically discredited premise No. 2.

The *third premise* sounds plausible, at first blush, but is basically unsound. From continuous dealings with various foreign trade commissions, Fellows asserts that comparatively few foreign buyers have evinced any overt eagerness to purchase used surplus machinery in preference to new. Sad experiences with our surplus machinery, after World War I, have not been forgotten and will only be repeated unless through sheerest necessity.

Thus the three leading contentions, advanced by those who oppose the donation of machines to schools, do not stand up under careful scrutiny. Furthermore, approximately 12,000,000 veterans are being demobilized, with many wanting to either continue or start engineering or vocational studies and financially able to do so only with government help. The schools need machine tools as never before in history to train these deserving veterans.

A.S.T.E. NEWS

NEWS OF INTEREST AND ABOUT MEMBERS

"More and Better Goods for Modern Living"

★ Theme of ASTE Pittsburgh Convention ★

RESOURCEFULNESS in bringing new metal working techniques to the production of more and better goods at lower costs is to be stressed at the ASTE Semi-Annual Meeting at Pittsburgh, October 10-12, as the tool engineer's role in the restoration of a prosperous, peacetime industrial economy.

Planned to augment their skill in designing multi-operation machinery, increasing production speeds, improving precision, and devising ingenious applications of methods and processes, the program for the convention will present to the Society's members the latest developments in manufacturing engineering.

Tooling—for mass production welding . . . with carbides . . . for gas turbines; precision casting . . . multiform grinding . . . manufacturing analysis—down to the fundamentals of tool engineering education as viewed by industry and science, will be discussed by speakers chosen for their practical knowledge of these subjects.

Local plant operations, observed under actual manufacturing conditions, and film demonstrations of new techniques will graphically illustrate the theories advanced from the platform.

The technical program will open Thursday afternoon, enabling even West Coast members to reach the convention without loss of a business day in transit. For those who arrive in the morning, there will be a two and one-half hour showing of carefully-selected technical motion pictures.

First technical session will have "Welding and Design" as its theme, with H. R. Shearer, Tool Engineer, Allison Engineering Co., Indianapolis, Ind., as its chairman. Robert H. Davies, Consulting Engineer, The Lincoln Electric Co., Cleveland, Ohio, will talk on "Welding and Structural Design for Machine Tools," including the procedure affecting machine tool design, methods of design, cost factors, and welding to close tolerances, illustrated with motion pictures.

He will be followed by A. E. Rylander, Technical Editor of *The Tool Engineer*, who will present "Welding Fixtures for Mass Production." Mr. Rylander will describe both manually and automatically operated fixtures and machines for large lot welding of small subassemblies and the welding of complete assemblies, using schematic drawings as illustration.

Gas Turbine Session

In the evening R. W. Ford, Sales Engineer for Ex-Cell-O Corp., Detroit, will introduce two lecturers on "Gas Turbine Tooling and Production," F. K. Fischer, Steam Application Engineer, and Norman L. Mochel, Manager, Metallurgical Engineering, Westinghouse Electric Corp., Philadelphia, Pa.

Mr. Fischer, in "Fundamentals of the Gas Turbine Power Plant," will outline the principles of the gas turbine and its field of application in transportation and stationary power plants, together with its possible future uses and developments. "Metallurgical Considerations of Gas Turbines," Mr. Mochel's paper, will divulge the nature of materials used in jet engines and gas turbines, the requirements for such applications, and some of the fabricating considerations.

Friday morning, "Precision Casting" will be studied, H. E. Linsley, Machine Tool Editor, *The Iron Age*, New York City, presenting W. O. Sweeny, Manager, Precision Casting Sales Div., Haynes Stellite Co., Kokomo, Ind.

Mr. Sweeny's discussion of "A Modern Tool for Engineers" will review the early history of precision casting with a step by step description of current commercial adaptations. Quality control, the metallurgy of alloys cast by this method, limitations, advantages and comparisons with other methods, and factors in design will be analyzed.

Finishing, tolerances, edge thicknesses and other details will be considered, with a survey of the present scope and a prediction of the future of this new commercial process. Slides and samples will be shown. Ample time is being allotted for informal discussion at the close of the lecture.

E. W. Baumgardner, Production Engineer, Industrial Ovens, Inc., Cleveland, Ohio, will conduct the Friday afternoon meeting devoted to "Tooling with Carbides." Philip M. McKenna, President of Kennametal, Inc., Latrobe, Pa., and first of three speakers, has chosen "Cemented Hard Carbide Compositions" as his subject.

He will examine the effect upon industrial history of new tools, possibilities opened up by the availability of compositions having combinations of properties hitherto unobtainable, describing the physical properties of a series of cemented hard carbide compositions.

The conclusion of Mr. McKenna's address will serve as an introduction to "Kennamilling," a discourse by Dr. Horace A. Frommelt, Director of Kennamilling Research for the same company.

Dr. Frommelt will trace the history of the application of carbide to milling,

(*Continued on Page 50*)

In This Issue

Chapter	*Page*
Binghamton	61
Buffalo-Niagara Frontier	63
Chicago	60
Cleveland	62
Detroit	63
Flint	63
Los Angeles	60, 63
New York, Greater	62
Peoria	61
Portland (Me.)	61
Rochester	60
Toledo	62
ASTE Productioneers Your Central Office Staff	46
Builders of ASTE A. H. d'Arcambal	64
Coming Meetings	61
Obituaries	60
Situation Wanted	62
"Tool Engineers' Handbook"	59

Pittsburgh's Statler-operated Hotel William Penn will be official headquarters for the Society's Semi-Annual Meeting, October 10-12. Other leading downtown hotels have earmarked blocks of rooms for the use of ASTE convention guests.

(*Continued from Page 49*)

limitations of the metal, and the development of tungsten titanium carbide for the machining of steel, both on single point and multi-tooth cutters.

He will define Kennamilling as a combination of a suitable carbide, plus a suitable holder for the solid carbide blades, and the proper technique for milling, showing examples of cutters.

Final speaker will be A. O. Schmidt, Research Engineer in Charge of Metal Cutting Research, Kearney & Trecker Corp., Milwaukee, Wis. Mr. Schmidt, who has had wide experience in engineering and educational circles, will discuss "Carbide Milling, Fundamentals and Applications."

Educational Symposium

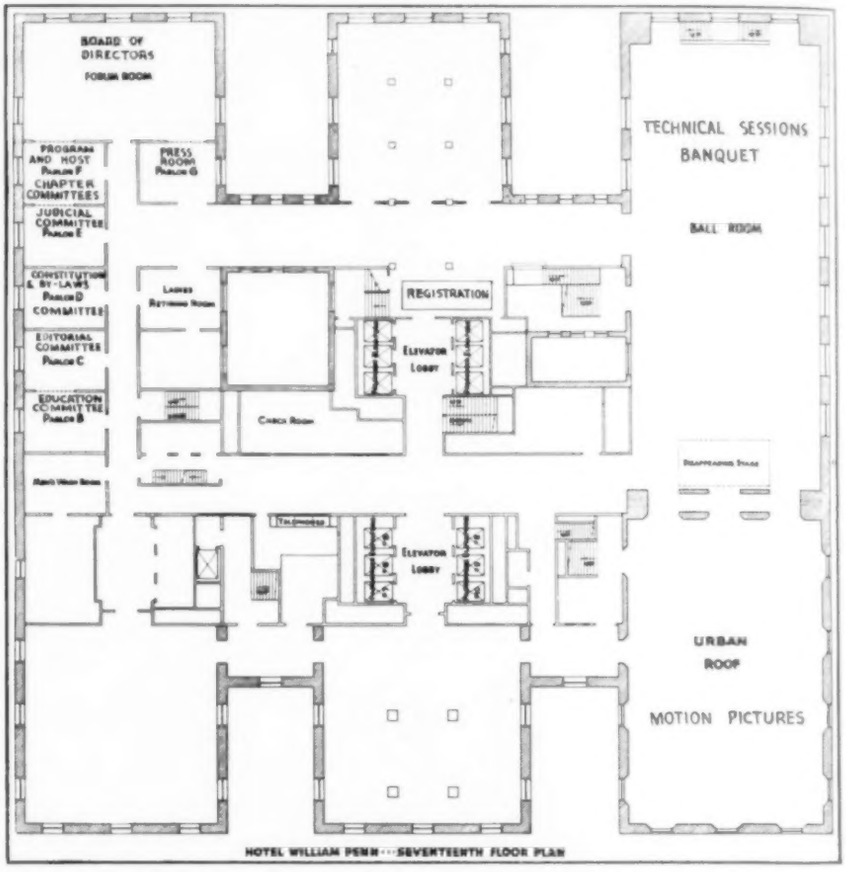
An interesting symposium has been arranged for Friday evening by O. W. Winter, Vice-President, Acme Pattern and Machine Co., Buffalo, N. Y., and National Education Chairman of ASTE. First topic of the meeting will be "Education and Industry View Tool Engineering." William D. Merrifield, Assistant to the Director of Industrial Education, Chrysler Corp., Detroit, will tell "What Industry Expects of Education in Tool Engineering."

At press time, tentative exponent of the counter proposal, "What Education Can Do for Industry in Tool Engineering," was expected to be D. B. Prentice, President, Rose Polytechnic Institute, Terre Haute, Ind., and Chairman of the Committee on Colleges, Engineering Council for Professional Development.

The ensuing "Symposium on Manufacturing Analysis," chairmanned by Prof. Halsey F. Owen, Dept. of Industrial Engineering, Purdue University, Lafayette, Ind., will be a panel discussion of the financial and technical phases of this comprehensive subject.

Participating in the forum will be Milton L. Roessel, Asst. Supt. of Methods, Graflex, Inc., and Sherman B. Hagberg, Instructor, Rochester Institute of Technology, both of Rochester, N. Y.; Eugene M. Bertschi, Training Supervisor, Caterpillar Tractor Co., Peoria, Ill.; C. D. Wright, Chief Tool Designer, McKinnon Industries, Ltd., St. Catharines, Ont.; and Chris A. Vogt, Tool Engineer, Cameron Iron Works, Houston, Tex., all members of the ASTE National Education Committee, along with the Committee Chairman, Mr. Winter.

Entire Floor Reserved for Pittsburgh Convention



All facilities of the 17th floor, Hotel William Penn, are being reserved for ASTE during the Society's Semi-Annual Meeting, October 10-12. Locations of various activities are indicated on floor plan.

Concluding technical meeting Saturday morning will treat phases of "Multiform Grinding," F. J. Schmitt, Sales Manager, D. A. Stuart Oil Co., Chicago, Ill., presiding.

"Recent Developments in Crush Grinding" will be set forth by Carl J. Linxweiler, Manager, Machine Tool Sales Dept., The Sheffield Corp., Dayton, Ohio. He will detail the current, most advanced practices in crush dressing of grinding wheels, including a discussion of power requirements for various types of work and the limits of practical application of the process.

J. C. Wilson, Chief Engineer and Sales Manager, The Thompson Grinder Co., Springfield, Ohio, will read a paper on "Truforming—Crush Form Grinding on Surface Grinding Equipment." Mr. Wilson will show how to determine by studying a contour whether it can be produced efficiently by this process and how the surface grinder should be engineered for each particular type of crush form grinding.

Data on crushing procedure, application of the machine for grinding as well as for crushing and truing, and production requirements of the manufacturer are other factors which the speaker will relate. Both Mr. Wilson and Mr. Linxweiler will augment their presentations with slides.

* * *

Concurrent with the technical sessions, tours will be operated to leading plants in the Pittsburgh area. On Thursday afternoon the Irvin Works of Carnegie-Illinois Steel Corp., Dravosburg, will show up-to-date sheet and strip mill operations. Largest subsidiary of the U. S. Steel Corp., the plant supplies sheets for automobiles, refrigerators and other products, as well as for tin plate, sheets and tin plate being the principal output.

At the Nuttall Works of Westinghouse Electric Corp., East Pittsburgh, members will see the most modern gear cutting and machining operations on gear manufacturing processes.

DOWNTOWN PITTSBURGH
SHOWING HOTELS, PRINCIPAL BUILDINGS AND POINTS OF INTEREST
NUMERICAL KEY
1 BLOCK HOUSE, OLD FORT PITT
2 JOSEPH HORNE DEPARTMENT STORE
3 ROOSEVELT HOTEL
4 ROSENBAUM DEPARTMENT STORE
5 KEYSTONE HOTEL
6 FRANK & SEDER DEPARTMENT STORE
7 KAUFMANN'S DEPARTMENT STORE
8 GIMBELS DEPARTMENT STORE
9 CHAMBER OF COMMERCE BUILDING
10 FORT PITT HOTEL
11 PENNSYLVANIA RAILROAD STATION
12 GREYHOUND BUS TERMINAL
13 GULF BUILDING
14 KOPPERS BUILDING
15 WM. PENN HOTEL
16 PITTSBURGHER HOTEL
17 GRANT BUILDING
18 B & O RAILROAD STATION
19 P. & L. E. RAILROAD STATION
20 BOGGS & BUHL DEPARTMENT STORE
21 BUHL PLANETARIUM
ALLEGHENY RIVER
MONONGAHELA RIVER
A·S·T·E HDQTRS.

Convention Registration To Be Streamlined

A card similar to the simplified registration form adopted for the New Era Exposition will be used for the Pittsburgh convention, to expedite admittance. Blanks on card will be filled in by registration attendant, upper section torn off and handed to registrant, in a lapel case. Members will pay $1.00 fee, guests $2.00. Color bands on cards will identify visitors as members or guests.

American Society of Tool Engineers

(MEMBER)

14th Semi-Annual Meeting
PITTSBURGH, PA.

Chapter 8

Name
Company Aff.
Mailing Add.
City and State

Pitts. Add.

Friday morning and afternoon these trips will be repeated, in addition to visits to the National Works of National Tube Co.; Fabricating Works, Aluminum Co. of America, New Kensington, Pa.; Westinghouse Air Brake Co., Wilmerding, Pa.; and Westinghouse Electric Corp. East Pittsburgh Works.

Complete steel mill and seamless pipe mill processes will be inspected at National Tube. Highlights of the Alcoa visit will include closeups of hydraulic extrusion of aluminum, the fascinating drawing of tubes from aluminum bloom stock, and the manufacture of foil.

The cooking utensil department will exhibit spinning, drawing and stamping operations. If time permits, convention guests will also visit Alcoa's magnificent Aluminum Research Laboratory.

Small Foundry Processes

Westinghouse Air Brake Co. will demonstrate outstanding small foundry processes, in addition to many interesting machining operations. The Westinghouse East Pittsburgh Works will be host for escorted tours of small motor, generator and switch gear production operations.

Other manufacturers, in process of reconversion and modernization, hope to be ready for company by convention time.

* * *

Thursday, Friday and Saturday mornings a program of excellent technical films will be screened, with a change of bill for each performance.

While the formal convention program is underway, committees and other bodies will gather to work on various Society projects. Thursday morning the Constitution and By-Laws Committee and the Education Committee will assemble, and Friday the Editorial Committee will be in session throughout the day.

Friday afternoon the new, streamlined Board of Directors will open its first meeting which is expected to continue through Saturday in order to clear the heavy agenda.

Scheduled for Saturday morning is the organization meeting of the Judicial Committee, composed of the nine, earliest, surviving past Presidents; and a Membership Committee conference.

National Program and Host Chapter Committees and the Press Room staff will be on duty throughout the convention.

* * *

One of the most eagerly anticipated and long-remembered events on the program will be the Saturday afternoon visit to Buhl Planetarium and Institute of Popular Science.

Here the visiting engineers may see, reproduced on the interior of the building's dome, a moving image of the heavens at any given time or place.

After the audience is seated and the theater darkened, a unique elevator arrangement built by Westinghouse engineers, silently lifts, from beneath the floor, the huge Zeiss projector which produces the "sky show."

At either end of the dumbbell-shaped machine, is a steel globe fitted with 32 projector units each consisting of a lens and a thin sheet of copper foil punched with holes of 65 sizes, the largest only $\frac{1}{30}$" in diameter.

By means of light passing through these holes, with no visible ray to indicate its source, "stars" of varying size and brilliance are produced.

Thousands of gears keep the various members of the solar system, running on different schedules, in their proper places, enabling the operator to manipulate the intricate instrument by pressing buttons on the control panel.

Other Planetarium exhibits, some mechanically vocalized, demonstrate recent scientific achievements of interest to every engineer.

Marchev, Banquet Speaker

Climax of the intensive, three-day technical conference will be the social get-together at the Semi-Annual Dinner Saturday evening, featuring the address of Alfred Marchev, President, Republic Aviation Corp. In relating "What Price Airplanes," Mr. Marchev will stress the importance of the tool engineer in the production of postwar aircraft. Entertainment by top-flight professional talent will be presented at the conclusion of the speaking program.

Between scheduled events, convention guests will find opportunity to explore the metropolis which has risen from William Pitt's settlement. Largely endowed by philanthropists of the city whose operations have made more millionaires than any other industrial center in the country, its civic, scientific and educational institutions enhance the business and cultural life of the community.

Particularly impressive is the night view from Mt. Washington, reached by an inclined railway. Spotlighted by the incandescence of many of its industrial operations, the steel city spreads below in a scene of luminary splendor.

Pittsburgh Banquet Tickets Now Available

Advance reservations for the Society's Semi-Annual Dinner, Saturday evening, October 12, at Hotel William Penn, Pittsburgh, should be made at once through the Central Office in Detroit.

With Pittsburgh's ready accessibility to many ASTE Chapter cities, and accommodations limited to 1000, demand is expected to exceed tickets available.

To make reservations, send the coupon on this page (or a reasonable facsimile) to the Society's Detroit office, together with the proper remittance. Tickets will be mailed at once to the address indicated on the reservation form.

American Society of Tool Engineers
1666 Penobscot Building, Detroit 26, Michigan

Please reserve _____ tickets for the Semi-Annual Dinner of the American Society of Tool Engineers to be held Saturday evening, October 12, at Hotel William Penn, Pittsburgh, Pa. Remittance of $_____ for _____ tickets at $5.00 each is enclosed herewith. Please send my tickets to the following address:

Signed _____

Address _____

Date _____

Requests for reservations must be accompanied by checks or money orders. *Do not send cash.* Tickets will be mailed at once.

SEND YOUR ORDER NOW

14th Semi-Annual Meeting

Day to Day Program

C. E. J. Brickner
Co-Chairman

K. G. Johnson
Chapter Secretary

G. C. Wood
Chapter Treasurer

G. P. Grace
Technical Meetings

William Owen
Banquet

Thursday, October 10, 9:00 A.M.

Registration, Elevator Foyer, 17th Floor
Hotel William Penn

9:30 A.M.

Technical Motion Pictures, Urban Room

10:00 A.M.

Constitution and By-Laws Com. Meeting
Parlor D

Education Com. Meeting, Parlor B

1:00 P.M.

Plant Visits
Irvin Works, Carnegie-Illinois Steel Corp., Dravosburg, Pa.
Nuttall Works, Westinghouse Electric Corp., E. Pittsburgh, Pa.

2:00 P.M.

Technical Session, Ballroom
"Welding and Design"

8:00 P.M.

Technical Session, Ballroom
"Gas Turbine Tooling and Production"

Friday, October 11, 9:00 A.M.

Registration, Elevator Foyer, 17th Floor
Hotel William Penn

Plant Visits
Fabricating Works, Aluminum Co. of America, New Kensington, Pa.
National Works, National Tube Co.
Westinghouse Air Brake Co., Wilmerding, Pa.
Westinghouse Electric Corp., E. Pittsburgh, Pa.
Also Thursday afternoon plant visit schedule

9:30 A.M.

Technical Session, Ballroom
"Precision Casting"

Technical Motion Pictures, Urban Room

10:00 A.M.

Editorial Com. Meeting, Parlor C

1:00 P.M.

Plant Visits
Same as Friday morning schedule

2:00 P.M.

Semi-Annual Meeting, Board of Directors
Forum Room

Technical Session, Ballroom
"Tooling with Carbides"

8:00 P.M.

Technical Session, Ballroom
"Education and Industry View Tool Engineering"
"Symposium on Manufacturing Analysis"

Saturday, October 12, 9:00 A.M.

Registration, Elevator Foyer, 17th Floor
Hotel William Penn

9:30 A.M.

Technical Session, Ballroom
"Multiform Grinding"

Membership Com. Meeting, Parlor B

Semi-Annual Meeting, Board of Directors
Forum Room

Motion Pictures, Urban Room
Presented by D. W. McGill, Machinery Electrification Mgr., Industrial Sales Dept., Westinghouse Electric Corp., E. Pittsburgh, Pa.

10:00 A.M.

Judicial Com. Meeting, Parlor E

2:00 P.M.

Visit to Buhl Planetarium and Institute of Popular Science
Sky Show, Micro-Zoo

6:30 P.M.

Semi-Annual Dinner, Ballroom
"What Price Airplanes"
Alfred Marchev, President, Republic Aviation Corp., Farmingdale, L. I., N. Y.

October 10-12

Press Room, Parlor G
Plant Tour Registration, 17th Floor
Banquet Tickets, Lobby and 17th Floor
Program and Host Chapter Committees, Parlor F
Hotel William Penn

HOST CHAPTER COMMITTEES

W. H. Schott
General Chairman

W. S. Risser
Chapter 2nd V. Chmn.

J. P. Wiley
Plant Tours

Gardner Young
Reception

P. H. Magnus
Chapter 1st V. Chmn.

D. L. Bardes
Accommodations

Technical Sessions

Thursday, October 10, 2:00 P.M.

"Welding and Design"

Chmn., H. R. Shearer, Tool Engineer, Allison Engineering Co., Indianapolis, Ind.

"Welding and Structural Design for Machine Tools"

Robert H. Davies, Consulting Engineer, The Lincoln Electric Co., Cleveland, Ohio

"Welding Fixtures for Mass Production"

A. E. Rylander, Technical Editor, *The Tool Engineer*, Detroit, Mich.

8:00 P.M.

"Gas Turbine Tooling and Production"

Chmn., R. W. Ford, Sales Engineer, Ex-Cell-O Corp., Detroit, Mich.

"Fundamentals of the Gas Turbine Power Plant"

F. K. Fischer, Steam Application Engineer

"Metallurgical and Fabrication Considerations of Gas Turbines"

Norman L. Mochel, Manager, Metallurgical Engineering

Westinghouse Electric Corp., Philadelphia, Pa.

Friday, October 11, 9:30 A.M.

"Precision Casting"

Chmn., H. E. Linsley, Machine Tool Editor, *The Iron Age*, New York City

"A Modern Tool for Engineers"

W. O. Sweeny, Mgr., Precision Casting Sales Div., Haynes Stellite Co., Kokomo, Ind.

2:00 P.M.

"Tooling with Carbides"

Chmn., E. W. Baumgardner, Production Engineer, Industrial Ovens, Inc., Cleveland, Ohio

"Cemented Hard Carbide Compositions"
Philip M. McKenna, President

"Kennamilling"

Dr. Horace A. Frommelt, Director of Kennamilling Research

Kennametal, Inc., Latrobe, Pa.

"Carbide Milling, Fundamentals and Applications"

A. O. Schmidt, Research Engineer in Charge of Metal Cutting Research, Kearney & Trecker Corp., Milwaukee, Wis.

8:00 P.M.

"Education and Industry View Tool Engineering"

Chmn., Otto W. Winter, Vice-Pres., Acme Pattern and Machine Co., Buffalo, N. Y.

National Education Chmn., ASTE

"What Industry Expects of Education in Tool Engineering"

William D. Merrifield, Asst. to Director of Technical Education, Chrysler Corp., Detroit, Mich.

"What Education Can Do for Industry in Tool Engineering"

(Tentative) D. B. Prentice, Pres., Rose Polytechnic Institute, Terre Haute, Ind.

Chmn., Committee on Colleges, Engineering Council for Professional Development

"Symposium on Manufacturing Analysis"

Chmn., Prof. Halsey F. Owen, Dept. of Ind. Eng'g, Purdue University, Lafayette, Ind.

A panel discussion of the financial and technical aspects of this keystone subject.

Otto W. Winter

Milton L. Roessel, Asst. Supt. of Methods, Graflex, Inc., Rochester, N. Y.

Sherman B. Hagberg, Instructor, Rochester Institute of Technology, Rochester, N. Y.

Eugene M. Bertschi, Training Supervisor, Caterpillar Tractor Co., Peoria, Ill.

C. D. Wright, Chief Tool Designer, McKinnon Industries, Ltd., St. Catharines, Ont.

Chris A. Vogt, Tool Engineer, Cameron Iron Works, Houston, Texas

Saturday, October 12, 9:30 A.M.

"Multiform Grinding"

Chmn., F. J. Schmitt, Sales Manager, D. A. Stuart Oil Co., Chicago, Ill.,

"Recent Developments in Crush Grinding"

Carl J. Linxweiler, Mgr., Machine Tool Sales Dept., The Sheffield Corp., Dayton, Ohio

"Truforming—Crush Form Grinding on Surface Grinding Equipment"

J. C. Wilson, Chief Eng. and Sales Mgr., The Thompson Grinder Co., Springfield, Ohio

R. W. Ford
Natl. Program Com.

E. W. Baumgardner
Natl. Program Com.

F. J. Schmitt
Natl Program Com.

H. E. Linsley
Natl. Program Com.

H. F. Owen
Natl. Education Com.

TECHNICAL SESSION CHAIRMEN

H. D. Hall, Chmn.
Natl. Program Com.

O. W. Winter, Chmn.
Natl. Education Com.

H. R. Shearer
Natl. Program Com.

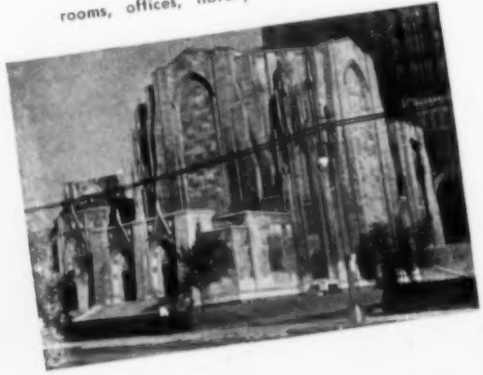
Pittsburgh . . Modern Vulcan

Fruits of Great Industries

Confluence of Allegheny and Monongahela forms the "Point," apex of the "Golden Triangle."

America's industry feeds on Pittsburgh coal. Fire boss checks for gas and safe roof after blast dislodges big chunks ready for loading in cars.

Nine-story Mellon Institute of Industrial Research, "Laboratory of the World," also contains lecture rooms, offices, library and museum for scientists.



▲ Bessemer converter illuminates the night sky, silhouetting blast furnaces, strip mill and other buildings of huge steel plant sprawled along both banks of the river.

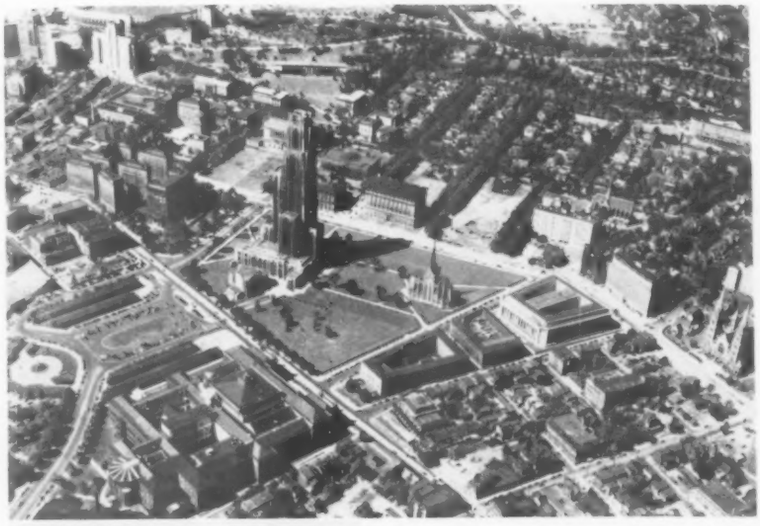
▶ Heinz Memorial Chapel on the University of Pittsburgh campus has tallest stained glass windows in the world, each containing over a ton of glass and lead; and seals of 90 American and European colleges cut into stone medallions.

▶ Newest and tallest skyscraper, the Gulf Building rises 582 feet from the sidewalk. Closely approaching it in height is 32-story neighbor, the Koppers Building. In foreground is home of Federal Reserve Bank.

◀ At doorstep of the University of Pittsburgh, the Stephen Foster Memorial honors the creator of "My Old Kentucky Home" and other well-loved American songs. Manuscripts, musical instruments and other Fosteriana are housed in the shrine.

Mecca For Tool Engineers

Enrich Tenth City's Culture



Situated in Schenley Park, Engineering Hall and other buildings of Carnegie Institute of Technology adjoin Carnegie Institute itself.

In the William Penn's Ballroom, ASTE Semi-Annual Dinner and technical sessions will take place.

In the Oakland District is Pittsburgh's civic center dominated by the 42-story University of Pittsburgh. Surrounding buildings include Heinz Memorial Chapel, Stephen Foster Memorial, Mellon Institute, Soldiers' Memorial Hall, Syria Mosque, home of world's largest Masonic shrine; and Carnegie Institute of Technology group.

Historic Blockhouse, remnant of strategic Fort Pitt, stands at point of the "Golden Triangle" on site of its bitterly-contested predecessor, Fort Duquesne. Located in heart of the business district, this weathered monument to the founding of Pittsburgh is open to visitors without charge.

Unique inclined railways solve problem of transportation on steep hills rising abruptly from the banks of the Monongahela.

Fresh from the ovens, these baked beans move along the assembly line at H. J. Heinz Co., major food products plant.

At night downtown Pittsburgh presents a gay, carnival appearance, sparkling with lights and shimmering reflections. Dazzling tower of the Gulf Building serves as landmark visible in most parts of the city.

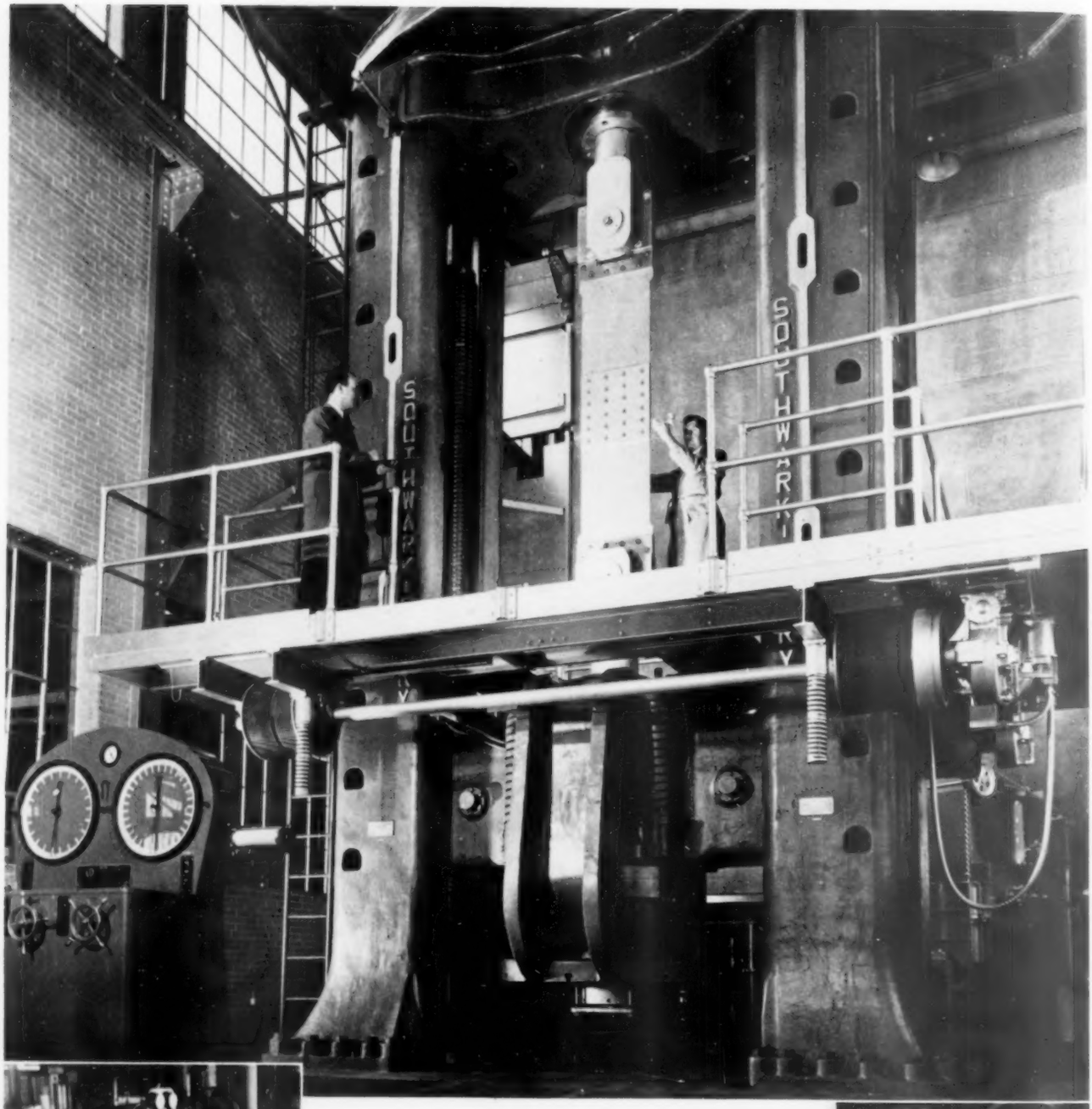
14th Semi-Annual

ASTE

Meeting

PEACETIME PRODUCTION ON PARADE

ASTE TO SEE METAL WORKING PLANTS

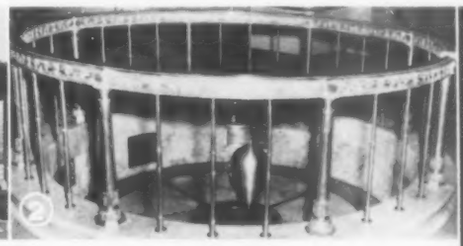


Center of a major metal production area, Pittsburgh will show ASTE convention guests some of its outstanding plants. This Templin precision metal working machine at the Alcoa Aluminum Research Laboratories can exert force of 3,000,000 lbs. in compression, 1,000,000 in tension at speeds up to 36" per minute, making it most powerful machine of its kind in the world.

1. Monster hydraulic extrusion press in Alcoa's New Kensington Works scientifically extrudes hot aluminum billets through dies. 2. At Westinghouse Electric Corp., parts are stamped out for small motors, generators and switch gears produced there. 3. Red hot sheet steel emerges from this 80" rolling mill in the Irvin Works of Carnegie-Illinois Steel Corp. at Dravosburg, Pa.

GEARS "MOVE HEAVEN AND EARTH"
AT BUHL PLANETARIUM SKY SHOW

Saturday afternoon visit to Buhl Planetarium and Institute of Popular Science will be an unforgettable highlight of the Pittsburgh convention. ASTE'ers will see performances of the "Sky Show" and "Micro-Zoo," extremes in worlds of the infinite and the infinitesimal. Silhouetted against the star-studded "sky" it has produced, the huge Zeiss projector, actuated by thousands of gears, shows in one minute all stars visible during a 24-hour revolution of the earth. Steel globes at either end of dumbbell-shaped machine project firmament in northern and southern hemispheres. Binocular-like projectors attached to framework depict planets as they wheel through the heavens.



1. Memorial to Henry Buhl, Jr., local philanthropist, the institution brings to the layman, through exhibits and demonstrations, an understanding of astronomy and other abstruse sciences. 2. The Foucault Pendulum, named for French physicist who originated such an apparatus, graphically proves earth's rotation. During the day, the metal weight, swinging from a swivel arrangement in the ceiling, gradually changes its direction with the earth's motion. 3. In the Orrery, a working model of the solar system, the planets revolve about the central sun at relative rates of speed.

Who's Who on the Program . . . .

A DISTINGUISHED company of engineers, researchers, industrialists and educators will take the platform at the Pittsburgh convention next month.

R. H. Davies, Consulting Eng., The Lincoln Electric Co., Cleveland, Ohio, attended U. of Minn., worked as Development Eng. at Northrop Aircraft, and as Supt. of several Permanente Metals Corp. plants before taking up welding problems and design with his present company. He is an ASM and AWS member.

Broadly experienced in shop practice and engineering, **A. E. (Andy) Rylander** has devoted himself to the development of tools and methods for mass production. Versatile as a designer, with many inventions to his credit, his work has run the gamut from fine tools and instruments through wire, and cable manufacture, to the automotive field. An extracurricular activity for many years, writing became his vocation when he was appointed Technical Editor of *The Tool Engineer* late in 1944.

With Westinghouse since his graduation from R.P.I. in 1930, **F. K. Fischer,** Steam Application Eng. at the Philadelphia plant, worked his way through circuit breaker engineering, research and development, and design engineering before reaching his present post six years ago. U. of Pittsburgh granted his M.S., and ASME and Sigma Xi claim him as a member.

P. M. McKenna

Alfred Marchev

F. K. Fischer

H. A. Frommelt

N. L. Mochel, Mgr., Metallurgical Eng. at the same plant, has spent his entire business career with Westinghouse, beginning in 1912 in the old Westinghouse Machine Co. He also acts as consultant for the Aviation Gas Turbine Div. Chairman of the ASTM Com. A-1 on Steel and a Joint ASME-ASTM Research Com., he belongs to ASNE, ASM, AIMME and AWS.

A U. of S. C. alumnus, **W. O. Sweeny,** Mgr., Precision Casting Sales Div., Haynes Stellite Co., Kokomo, Ind., entered general metallurgy work at the Union Carbide & Carbon Research Laboratories in 1935, joining Haynes Stellite two years later. In 1942 he went to Washington to aid WPB as metallurgical consultant, returning to his company in the capacity of Chief of Wrought Steel Section until assuming his present duties.

* * *

P. M. McKenna, Pres., Kennametal, Inc., Latrobe, Pa., is the fourth generation of a Pittsburgh family prominent in metal working industries. Discovering and inventing a process of separating nickel from cobalt, at the age of 16, he was associated for several years with a company producing tungsten from low grade ore by an invention of his. As Research Dir. and Vice-Pres. of Vanadium Alloys Steel Co., he developed practical applications in cemented hard tool compositions made from refractory compounds. His outstanding achievement was the synthesizing of a new compound, tungsten-titanium carbide.

* * *

Dr. H. A. Frommelt, Dir. of Research for Kennametal, is well known in education and industry. Seasoned as professor and head of Mech. Eng. at Marquette U. and Supt. of Apprentices at Falk Corp., Milwaukee, he was well equipped to inaugurate the Milwaukee District War Training Program. During the war years he was associated with Kearney & Trecker, first as Dir. of Sales Promotion, then as Dir. of Industrial Research.

A former teacher of Production Engineering at Colorado State Coll., U. of Ill. and Marquette U., **A. O. Schmidt,** Research Eng. in charge of Metal Cutting Research, Kearney & Trecker Corp., Milwaukee, Wis., is another educator recruited to the ranks of industry. His experience also embraces graduate work under Prof. Boston at U. of Mich. and ten years as Mech. Eng. for the famed Carl Zeiss Optical Works.

* * *

While attending college, **W. D. Merrifield,** Asst. to the Dir. of Ind. Education, Chrysler Corp., Detroit, took advantage of summer vacations to gather industrial experience at Packard Motor Car Co., Chrysler Corp., and Wilding Picture Production Co. in Detroit. Before joining the Chrysler Ind. Education staff in 1941, he served as High School Principal in Irvine, Ky.

An instructor in engineering since 1912, **D. B. Prentice,** Pres., Rose Polytechnic Inst., Terre Haute, Ind., was delegate to the World Eng. Congress at Tokyo in 1929, and holds memberships in many organizations. He was granted advanced degrees in engineering, education, science and law by Yale U., Lafayette and Wabash Colleges.

C. J. Linxweiler, Mgr., Machine Tool Sales Dept., The Sheffield Corp., Dayton, Ohio, brings a wealth of experience in the practices of precision form and contour grinding and the application of machine tools to various industries. Earlier he spent a number of years in radio and electronics engineering, following his graduation from Ohio State U.

J. C. Wilson, Chief Eng. and Sales Mgr., The Thompson Grinder Co., Springfield, Ohio, is well versed in the manufacture of grinding wheels and in the design and building of precision grinding machines through his broad background in the abrasive field.

* * *

Banquet address of **Alfred Marchev,** Pres., Republic Aviation Corp., climaxes the convention. As a Swiss schoolboy, he built and flew gliders, attempted flight duration records while studying engineering. After several engineering assignments in the U. S., he headed Temple Radio Corp. of Chicago and Euro-Merican Patent Corp., before being named Vice-Pres. of Republic in 1942. He has over 400 patents in various fields and holds offices in several aeronautical organizations.

J. C. Wilson

A. E. Rylander

W. D. Merrifield

N. L. Mochel

A. O. Schmidt

C. J. Linxweiler

W. O. Sweeny

R. H. Davies

Valuable By-Products Developing from Handbook Compilation

ORIGINAL PRODUCT PLANNING does not have by-products as its prime objective . . . frequently does not see them ahead . . . sometimes finds them of marginal worth . . . occasionally discovers them the tail wagging the dog.

As in the case of so many industrial fabrications, the "Tool Engineer's Handbook" creates by-products as compilation goes along. Some of them can scarcely be foreseen now; others will not be evident until the book is actually published and in use.

Among presently perceptible by-products, Handbook Editor Frank W. Wilson sees:

1. THE BUILDING OF A CENTRAL OFFICE LIBRARY

   Since the beginning of Handbook preparation, subscriptions to technical magazines have been augmented until the file now includes most of the leading periodicals in the metal working field.

   More than 600 equipment and supplies manufacturers have furnished catalogs and bulletins.

   Acquisitions from societies, institutes and governmental departments range from published standards to technical bulletins and brochures.

   (Editor Wilson appeals to every member of the Society to contribute to the ASTE Library whatever technical material he can spare—textbooks, handbooks, company data sheets, reprints of published articles, and other publications.)

2. REFERENCE SERVICE TO ASTE MEMBERS AND OTHERS

   All data received, with any bearing on tool engineering, is indexed and coded for easy reference.

   As provided in the By-Laws of the Society, this information is available to members and non-members alike. Browsing among the many cataloged publications in the Detroit office may suggest some new source of help on a specific problem.

3. MAKING SOCIETY OBJECTIVES BETTER KNOWN

   Handbook activities radiate in many directions over the industrial sphere. They encompass the co-operation of manufacturers, organizations, individuals and many other sources of material—competent authorities willing to devote hundreds of hours to writing treatises on subjects in which they are specialized . . . others who will consent to contributing valuable time in reviewing manuscripts . . . magazine and book authors and publishers who will grant permission to use tables and charts or to quote text.

   In all of these phases, the Society's objectives must be fully and carefully explained in order to win cooperation in securing vital contributions.

   As the end product, many important influences in the modern industrial scene are becoming better acquainted with ASTE and more heartily disposed to enter into its manifold activities "for the advancement of scientific knowledge in the field of tool engineering."

Besides those already announced through the pages of *ASTE News*, acceptances to contribute editorially to the Handbook have been received from:

Richard R. Nolan, Director of Service, Northrop Aircraft, Inc., Hawthorne, Calif., a veteran in the aircraft industry since 1929 when he became associated with Kinner Airplane and Engine Co. in the assembly and servicing of aircraft engines.

Five years later, he joined the old Northrop Corp., working on final assembly, tool designing and tool planning. By 1939, when he terminated this connection, he was in charge of all tooling operations, and the company had become the El Segundo Division of Douglas Aircraft.

R. R. Nolan

With the formation of the present Northrop company, Mr. Nolan was made Supervisor of Tooling, subsequently advancing to Manager of Production Engineering, a position embracing the functions of planning, tooling, industrial engineering, scheduling and manufacturing control.

Advances to New Posts

Promotion to Assistant Factory Manager followed in 1944, and in March of this year, he entered the Sales Division in the dual capacity of Director of Service and Assistant to the Vice-President in Charge of Sales.

In addition to the book, "Machine Tools in Aircraft Production," Mr. Nolan has written a number of articles for current trade publications.

* * *

Victor H. Ericson, Vice-President of Johnson, de Vou, Inc., Boston, Mass., got his foot on the first rung of the industrial ladder as an order and schedule clerk at the American Steel & Wire Co., Worcester, Mass.

V. H. Ericson

Conscientious service on this assignment brought him promotion to Assistant Foreman, followed by a connection with Norton Co. of the same city, which was to continue for more than 20 years.

As a Norton Grinding Engineer, Mr. Ericson became well-known in the New England area, as well as for his addresses to ASTE Chapters on the subject, "Refined Surface Finishes as Applied to Cutting Tools."

A charter member of Worcester Chapter, ASTE, where he served several terms as Editorial Chairman, he has held office as National Membership Chairman and is the incumbent National Treasurer.

* * *

Werner I. Senger is immediately recognized in the field of engineering as an expert on balancing machines. For a number of years, he had charge of Balancing Machine Engineering at Gisholt Machine Co., Madison, Wis., where he is now Manager of the Balancing Machine Division.

Most of his professional career has been spent with the Gisholt Co., since 1925 when he took charge of the designing and development of machine tools. During the subsequent period, he has had a number of patents issued on machine tools and balancing machines.

W. I. Senger

Various technical periodicals have published his papers on the subject of Balancing Machines and Balancing Problems.

Mr. Senger received his B.S. in M.E. in 1923 from the University of Wisconsin at Madison, his home town. A year later Yale University conferred his M.S. During the intervening year, before joining the Gisholt Co., he returned to his alma mater to teach Steam and Gas Engineering. He is a member of ASME and the Army Ordnance Association.

* * *

For two decades, **John M. Walter** has been contributing his engineering knowledge and inventiveness to The G. A. Gray Co. of Cincinnati, Ohio, whom he now serves as Vice-President in Charge of Engineering.

J. M. Walter

In direct charge of new designs brought out by the company, Mr. Walter has been personally responsible for many inventions relating to machine tools. One of the most recent of these, non-metallic table way bearings for planer tables, greatly minimizes table distortion caused by scoring of the ways during high speed operations.

Before becoming associated with The Gray Co., Mr. Walter had acquired experience in automotive designing.

Leading technical publications have carried his articles on Planing. A director of the Cincinnati Section, ASME, Mr. Walter also serves on the Committee for Standardization of Spindle Tapers, sponsored by NMTBA.

* * *

After graduating from Lehigh University, Bethlehem, Penna., in 1925, **H. B. Chambers**, Metallurgical Engineer for Atlas Steels Limited, Welland, Ontario, began his professional career with the Pittsburgh Crucible Steel Co., Midland, Penna. A year later he joined the Metallurgical Department of the Timken Roller Bearing Co., Canton, Ohio.

H. B. Chambers

Then in 1931, he went to Canada to begin a fifteen-year association with his present company.

Mr. Chambers is the author of a bulletin, "How to Choose Tool Steels," and has addressed some of the Canadian ASTE Chapters, concerning "Selection of Tool Steels."

Fun and Feast Highlight Rochester Chapter Outing

Rochester Chapter picnicked June 22 at Buckholtz Flats in Irondequoit Creek Valley near Powder Mill Park. 1. "Doc" Hall tees off from top of 12" rubber hose. Contestant who drives tennis ball farthest is winner. Russell Howard (in baseball cap) conducts game. 2. In the nail driving contest, contenders were allowed three blows to drive a 30-penny spike into a timber. R. T. Barnett (with hat), Public Relations Chairman and Chapter photographer, had charge of this event. "Guy" Newton (center, holding cup), a former Chairman, is an interested spectator. 3. Remaining four entrants are slugging it out in the "balloon busting" competition. Onlookers cheer their favorites. 4. With appetites whetted by sports activities, ASTE'ers work their way through the chef's assembly line. 5 and 6. Empty plates and expressions of content reflect satisfaction in bountiful meal which topped off day of recreation. Among those shown are Past Chairmen Joseph Schick, Clifford Sears and Chauncey "Guy" Newton; and Chairman Charles Seely.

Obituaries—

George W. Wise

In the passing of George W. Wise, Chief Tool Designer at Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., on August 6, the Society lost one of its staunchest supporters and most active members.

G. W. Wise

Mr. Wise, who had recently been under a physician's care for heart trouble, succumbed to a heart attack at his home in Minneapolis at the age of 60.

Nicknamed the "Granddaddy" of Twin City Chapter, he was prominent in the organization of that group. For three years he served as Chapter Chairman, then as Standards, Industrial Relations, Constitution and By-Laws, and Education Chairman. For the past four years he had headed the Chapter Membership Committee.

In April of this year, he represented the Twin City group at the first meeting of the House of Delegates in Cleveland.

He was active, too, in other National affairs of ASTE, having been a Director for three years, Assistant to the National Publicity Committee, and Regional Representative of the Emergency Defense Training Committee. At the time of his death, he was a member of the National Constitution and By-Laws Committee where his keen judgment and counsel will be missed, as well as in his home Chapter.

Mr. Wise was born in Huntley, Ill., and educated in the public schools of Gridley and Princeton, and at Armour Institute, Chicago, Ill.

Since his apprenticeship at Gisholt Machine Co., Madison, Wis., he had had wide industrial experience in many parts of the country. He was employed at Oliver Farm Equipment Co., Charles City, Iowa; Buick Motor Co., Flint, Mich.; Barber-Colman Co., Rockford, Ill.; Fairbanks, Morse & Co., Beloit, Wis.; Minneapolis-Moline Power Implement Co., and Electric Machinery Mfg. Co., Minneapolis.

In 1935, he joined Minneapolis-Honeywell as Tool Room Superintendent, becoming head of Tool Design in 1942. He was also a member of the local Foreman's Club.

Harold Worden

Harold Worden, 54, of the Purchasing Division of Willys-Overland Motors, Inc., Toledo, Ohio, died of heart failure, July 15, after a brief illness.

Born in North Kingston, R. I., Mr. Worden graduated from the public schools of Providence and attended the Rhode Island School of Design and Brown University.

After serving an apprenticeship at Brown & Sharpe Mfg. Co., he was employed by the American Engineering Co. at Philadelphia, and the H. A. Tillinghast Construction Co. of New York City.

For a number of years, he conducted his own business before becoming associated with Willys-Overland in 1940. There he served as process engineer and in tool follow-up until two years ago when he was made a buyer in the Purchasing Division.

A World War I veteran, Mr. Worden was a Boy Scout commissioner, and was affiliated with the Meridian Sun Masonic Lodge, Philadelphia, and the Rosewood Avenue Presbyterian Church of Toledo. He was a popular member of Toledo Chapter, ASTE.

Hand Miller's Versatility Demonstrated in Film

Los Angeles, Calif.—Technical feature at the August 8 meeting of Los Angeles Chapter was a presentation of the film, "The Miller That Uses Its Head," with comments by Carl Westhaver, Field Engineer of Harron, Rickard and McCone.

The moving picture demonstrated the application of the Nichols Hand Miller for various production and tool room machining operations. Particularly impressive to the tool engineers was the versatility of the machine and its ability to take heavy cuts, yet turn out very accurate work.

Coffee speaker was Dr. John R. Lechner who discussed "The American Philosophy of Government."

National Director Arthur J. Denis, a former Chairman of the Chapter, presented a Past Chairman pin on behalf of the Chapter, to Louis Biehler, first Chairman of the Los Angeles group.

Announcement was made by Harold Miller that the Chapter's annual picnic was scheduled for September at Valley Park Country Club.

Leslie Hawes, First Vice-Chairman, presided at the meeting during Chairman Anton Peck's absence on vacation.

Hecht Forms Company

Chicago, Ill.—Irving A. Hecht, formerly General Sales Manager for Willey's Carbide Tool Co., Detroit, has established a firm known as Irving A. Hecht & Associates, with offices at 30 North LaSalle St., Chicago.

The new company will specialize in the cutting tool engineering field as consultants and manufacturers' representatives.

A graduate in mechanical engineering from Massachusetts Institute of Technology, Mr. Hecht has served in the U. S. Coast Guard Reserve and is a member of Chicago Chapter, ASTE.

Coming Meetings

DAYTON—October 14, 6:30 P.M., Plant Visit and Dinner, Monarch Machine Tool Co., Sidney, Ohio. Subject: "Contour Cutting in a Lathe." Demonstration of standard equipment.

DECATUR—October 14, 6:30 P.M., The Decatur Club. Speaker: Harry Coopland, Special Representative, Jack & Heintz, Inc., Cleveland, Ohio. Subject: "Seeing Is Believing." November 11, 6:30 P.M. Speaker: Chester Mott, Metallurgist, Fansteel Co., Chicago, Ill. Subject: "Hard Facing of New Tools and Its Use in Tool Repair."

ELMIRA—October 7, 7:00 P.M., Mark Twain Hotel. Speaker (tentative): Dr. Lillian M. Gilbreth, Management Consultant. Subject: "Motion Study." Original films of Frank B. Gilbreth will be shown.

FLINT — September 19, 6:45 P.M., Fischer's Hotel, Frankenmuth. Speaker: G. E. Brumbach, Metallurgical Engineer, Carpenter Steel Co., Reading, Pa. Subject: "Tool Steels and Their Applications."

PITTSBURGH — October 10-12, Semi-Annual Meeting, ASTE; October 11-12, Semi-Annual Meeting, Board of Directors; October 12, Semi-Annual Dinner; Hotel William Penn.

TORONTO—Father and Son Night, October 21, Concert Hall, Royal York Hotel. Speaker: His Worship Robert H. Saunders, K. C., Mayor of Toronto.

Secretary of War Recognizes Mair

Poughkeepsie, N. Y.—William J. Mair, Superintendent of Plant No. 4, International Business Machines Corp., Poughkeepsie, has received a Certificate of Appreciation from the Secretary of War "for patriotic service in a position of trust and responsibility."

W. J. Mair

The presentation, along with 13 others to New York State industrial executives, was made by Major General Henry B. Sayler, Deputy Chief of Ordnance of the Army Service, in New York City.

Mr. Mair was one of six honored for their work in expediting the manufacture of materiel for the Ordnance Department. He is a member of Binghamton Chapter, ASTE.

175 Enjoy Family Outing

Peoria, Ill.—The second annual family picnic of Peoria Chapter was held August 11 at the American Legion log cabin, Washburn.

An all day outing, the event was attended by 175 members and their families who not only enjoyed the "Beck-style" fried chicken dinner, but also participated in golf, horseshoes, croquet and other games.

Robert W. Bayless, Entertainment Chairman, was assisted by E. R. Beck, chief cook; John Fischer, K.P. pusher; Mr. and Mrs. James Baker and Herman Krei, K.P.'s; and Ted Saal, games.

Maine Group Entertains Officers at Field Day

Portland, Me.—More than 65 members and guests of Portland Chapter enjoyed a field day, June 29, at Stickney Lodge, a private fish and game club in Goodwin Mills.

Activities at the outing included softball and horseshoe pitching, followed by a shore dinner. Principal speaker was E. C. Gwaltney, Director of Research for the Saco-Lowell Shops, Biddeford, who discussed the importance of the tool engineer in the textile industry.

A surprise feature was the presentation of silk State of Maine flags to several National Officers who were present. Past Chairman John M. Johnston presented flags to President A. M. Sargent, Third Vice-President I. F. Holland, National Treasurer V. H. Ericson, and Executive Secretary Harry E. Conrad.

Other member guests, from Boston, Worcester and Springfield, Mass., and from points in Maine as much as 130 miles distant, included National Director W. W. Young, Jack Savits, Chairman, and Wallace Swanson, Secretary, of Boston Chapter.

Portland (Maine) Chapter showed "down East" hospitality to ASTE National Officers who were guests at field day held June 29 at Stickney Lodge in Goodwin Mills. 1. (Photo courtesy Portland Sunday Telegram) Standing (left to right): I. F. Holland, 3rd V. Pres.; A. M. Sargent, Pres.; V. H. Ericson, Natl. Treas.; E. C. Gwaltney, Director of Research, Saco-Lowell Shops, Biddeford, and principal speaker of the occasion; H. E. Conrad, Exec. Secy., ASTE; C. L. Bohlin, 1st V. Chmn., and F. E. Kimball, 2nd V. Chmn., Portland Chapter. Kneeling, in same order: F. E. Thomes, Treas.; E. L. Wishart, Secy.; and Merton Corson, Chmn., all of the host group. 2. T. H. Anderson enjoys the bright sunshine which favored the outing. 3. H. E. Butler (left), and Tom Bradford of Worcester chat in a cool corner of the porch. 4. Harry Conrad gets some first hand information on baiting a hook. 5. J. M. Johnston (left), Past Chmn. of Portland Chapter, and J. B. Savits, Boston Chapter Chmn., compare notes. 6. Back in his Detroit office, Exec. Secy. Conrad shows R. B. Powers, Exec. Editor of The Tool Engineer, blue silk State of Maine flag presented to him at the outing. State seal design on flag is surmounted by the North Star, symbolic of Maine's position. Motto, "Dirigo," means "I direct." Farmer with scythe represents agriculture, while the sailor resting on an anchor typifies navigation and fishing. Between them is a moose reclining beneath a pine tree – both native to Maine.

Calls Special Meeting To Organize Activities

Detroit, Mich.—A special meeting of the National Constitution and By-Laws Committee was called July 20-21 at Detroit by Chairman Ray H. Morris, for the purpose of organizing a well functioning unit, as well as to review and recommend to the Board of Directors suggestions received from the Society as a whole and, particularly, from the House of Delegates.

R. H. Morris

A number of additions and revisions to the Society procedures, compiled by the Organization Progress Committee and the Constitution and By-Laws Committee, were drafted for consideration by the Board.

Invited to express his viewpoints for the future guidance of the Committee, President A. M. Sargent, who was present during the deliberations, summarized as suggested functions:

To keep the procedures of the Society abreast with the times for all concerned, using recommendations presented by the membership as a basic platform.

To maintain contact with Chapters in each individual area, assisting in the education of officers and members for better unification of procedures in the Society at large.

To organize itself into a stable unit to carry on from year to year, adding such members as may be needed to complete its assignments.

Committeemen attending the meeting, in addition to Chairman Morris, were: J. J. Demuth, Vice-Chairman (St. Louis), Earl W. DeBisschop (Rochester), T. J. Donovan, Jr. (Philadelphia), E. J. Berry (Little Rhody), H. R. Wentzell (South Bend, and C. F. Staples (Pontiac). George W. Wise (Twin City), since deceased, was unable to be present. Because time did not permit making transportation arrangements, H. H. Hagedorn (Golden Gate) was not requested to attend the meeting.

Golfers Get Together At Summer Outing

Cleveland, Ohio—Aided and abetted by perfect weather, 150 Cleveland Chapter members and their friends went around the course, July 12, at the Pine Ridge Country Club, Wickliffe.

In the evening, dinner was served at the clubhouse, with group singing accompanied by strolling musicians.

In addition to a number of door prizes, golf prizes were awarded to Lew Alle, J. Hauserman, Jack Schron, Otto Ahlegian, A. Giebner, R. Whitaker, J. Rodman and R. Southwall.

J. R. Fitzsimmons, Entertainment Chairman, handled arrangements for the annual summer golf party.

Situations Wanted

TOOL ENGINEER—6 years' experience in supervision of process and design for machine tool and automotive manufacturers; 8 years as toolmaker and production line machinist. Seeks position as chief tool engineer or industrial engineer. Address Box L, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

Tigges Made Director Of Export Agency

Toledo, Ohio — Herbert L. Tigges, Vice-President and Sales Manager of Baker Bros., Inc., has been named a director of the Amtea Corp., New York City.

Formed a year ago, the Amtea company handles export sales of machine tools for all Latin and South American countries, for 12 of the largest machine tool builders in this country.

Mr. Tigges is a member of Toledo Chapter, ASTE, where he has served as Speaker's Chairman.

Manhattan Group Joins New Engineering Council

New York City — Charter member organizations of the recently formed Engineering Societies Council of New York include Greater New York Chapter ASTE.

Chapter delegates to the Council are W. C. Rhodes, Jr., Production Manager, Air Associates, Teterboro, N. J.; and J. D. Schiller, Engineering Dept. Chief, Western Electric Co., Kearny, N. J., both former Chapter Chairmen.

H. L. Horton, Editor of Industrial Press, New York City, and incumbent Chapter Chairman, has been chosen alternate.

Other engineering, scientific and technical societies represented in the new organization are: American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Heating and Ventilating Engineers, American Society of Mechanical Engineers, American Society for Metals.

J. D. Schiller

W. C. Rhodes, Jr.

American Society of Safety Engineers, American Society for Testing Materials, American Chemical Society, American Welding Society, Illuminating Engineering Society, Institute of Radio Engineers, and the Society of Motion Picture Engineers.

Purposes of the Council, as set forth in its constitution, are:

To provide a medium for cooperative action by the member societies on matters of mutual interest which are beyond the scope of the individual organization or which can be performed better by cooperative action.

To encourage interest and participation in public affairs which are scientific or technical in scope.

To cultivate greater appreciation by the public of the part which engineering, science and technology contribute to human welfare.

To provide a means of more effective public service by the member societies of the Council.

To promote greater unification of the engineering profession and cooperate in a general program for the enhancement of the professional status of the engineer.

To promote coordination and integration of the inter-organization activities of the member societies.

To publish information of interest to the member societies.

To cooperate with organizations having similar objectives in other communities.

Formation of the Council was the outgrowth of the participating societies' joint efforts during the war period, as the Engineering Societies Committee on War Production.

Decision to continue activities on a peacetime basis followed the dissolution of the wartime Committee.

Officers Plan Activities in Summer Conference

National Officers of the Society gathered July 5 and 6 at "Clovelly," President A. M. Sargent's summer home at Meredith, N. H., on Lake Winnipesaukee. Around the table, from left to right, are: I. F. Holland, Third Vice-President; W. A. Dawson, National Ass't Secretary-Treasurer; and R. B. Douglas, National Secretary (behind Mr. Holland); Mr. Sargent (at end of table), H. E. Conrad, Executive Secretary; W. B. Peirce, First Vice-President; V. H. Ericson, National Treasurer; and R. B. Powers, Executive Editor of The Tool Engineer. All phases of the Society's activities were thoroughly discussed.

Standards Ch'm Names Canadian Committee

Detroit, Mich.—Appointment of the ASTE Canadian National Standards Committee, authorized during the last meeting of the Board of Directors, has been announced by W. H. Smila, Chairman of the Society's National Standards Committee.

W. A. Thomas

W. A. Thomas of Windsor Chapter will chairman the new committee. A member of the National Standards Committee and the Data Sheet Sub-Committee, Mr. Thomas is Standards Chairman in his Chapter.

Assisting him will be: W. W. Werthmiller (Hamilton), G. S. Clarke (Montreal), M. G. Eldred (Niagara District), and the Standards Chairmen of Toronto and Lakehead Chapters.

The committee, composed of Standards Chairmen from the various Canadian Chapters, constitutes a strong, capable body for the handling of all Standards problems affecting the Canadian membership.

Representing the Canadian Chapters in all phases of Standardization work, the new Standards group will function under the jurisdiction of the National Standards Committee.

Distribution of Data Sheets, to be supplied by Canadian manufacturers for ASTE members in their country, will be handled by the Canadian committee. The sheets will be processed by the Data Sheet Sub-Committee, but will be printed and mailed in Canada.

This new service will give Canadian members needed engineering data on tools and machinery manufactured and marketed within the Dominion.

Through its recent affiliation with the Canadian Standards Association, it is expected that the Society will participate in the unification of American and Canadian Standards.

Gambles Organize New Company

Buffalo, N. Y.—William J. Gamble and his son, Ensign Robert N. Gamble, have announced their partnership as Gamble and Gamble, Manufacturers Representatives, with offices in Buffalo.

W. J. Gamble

The former, well known as a sales executive in the metal working field, has for a number of years served the Buffalo industrial area as manufacturers agent. Earlier he was associated with the Iroquois Iron Works, Dobbie Foundry & Machine Co., and Farrar & Trefts, Inc.

A past National Director of ASTE, Mr. Gamble has been Membership Chairman and Chairman of Buffalo-Niagara Frontier Chapter. He now serves on the Natl. Public Relations Committee.

Ensign Gamble, recently released from active Navy duty, is a graduate in Mechanical Engineering from Rensselaer Polytechnic Institute, Troy, N. Y.

Flint Chapter Chairman L. A. Kitchen prepares to do a William Tell, teeing off with a soft ball reposing on Cliff Bendle's nose. Other members look on with amusement during first annual golf stag, July 13, at Shore Acres Country Club on Lake Fenton. Sports program occupied engineers.

Sports Fans Enjoy Annual Stag Day

Flint, Mich.—Members of Flint Chapter enjoyed their first annual golf stag, July 13, at the beautiful Shore Acres Country Club on Lake Fenton.

Ideal weather prevailed for the golf, horseshoe pitching, riding, baseball and numerous other activities indulged in by the muscle-bound tool engineers. Prizes were awarded to the winners of the various events.

Some eighty members and friends played a blind bogey round of golf. Seventy-one, the winning round, was scored by B. B. Font of the C. N. Monroe Mfg. Co.

Horseshoe champions were Leon Pratt and John Johnson who offered to take on all comers, but, after a demonstration of their skill, they found few takers. Cliff Bendle provided the comedy relief for the outing which was capably conducted by Harlan Pierpont and Arthur Close.

Millions of Contacts With Precision Switch

Los Angeles, Calif.—A tiny electric switch, which makes contact upon a fraction of a thousandth of an inch movement of the plunger, was explained to members of Los Angeles Chapter at their sixth anniversary meeting, July 11.

Other adaptations of the small, precision, snap acting switch were also described and demonstrated by Vearn J. Warne and Emmet Hughes of the Micro Switch Corp., Freeport, Ill.

The speakers presented a sound film, "Uses Unlimited," showing in color photography the manifold applications of the Micro Switch, including many uses in mass production tools and machines, particularly in gages and measuring devices. The processing of the film itself was controlled by Micro Switch operated thermostats and reels, the engineers were told.

The accompanying display of Micro Switches in graduated sizes included many variations of the basic form. From the parent device, the company's engineers had developed a diminutive switch, about half the size of the original, but with great durability and sensitivity.

"V3," a model no bigger than a vest pocket match box, is so sensitive in one of its versions that a force of three "inch-grams" is sufficient to operate it. Although rated 110-v, 10-amp., the basic switch can carry a load of 100-w and control circuits of as high as 440-v.

Heart of the device and secret of the dependable sameness of repeat ability, through millions of operations, is the carefully heat treated spring made of beryllium copper. Another feature important to the success of the switch is the achievement of practically the same coefficient of expansion in the molded plastic case and the metal it encloses.

At the conclusion of their discussion, the speakers answered many questions from the keenly interested audience.

268 Golfers Compete For Annual Trophy

Detroit, Mich.—More than 300 members and friends of Detroit Chapter attended the Chapter's Annual Golf Tournament, July 27, at the Gowanie Golf Club near Mt. Clemens, in which 268 actively participated.

J. M. Delaney, of Goddard & Goddard Co., won the annual Chapter trophy, with a low net score of 79, nosing out last year's champion, Lloyd G. Briggs of Packard Motor Car Co., by one stroke.

J. M. Delaney, new golf champ of Detroit Chapter, proudly displays trophy awarded for low net score at the Chapter's Annual Golf Tournament, July 27, at the Gowanie Golf Club.

A portable radio, the grand door prize, was included among the awards distributed.

The entire facilities of the club were reserved for the Chapter's use throughout the day. A buffet lunch was served at noon. Many of the members remained for dinner and an evening of games.

Motion pictures were made of the event for showing at the September Chapter meeting.

Builders of A. S. T. E.

A. H. d'Arcambal, President, 1940-41

By O. B. JONES, *Society Historian*

HERE'S ANOTHER chapter in the history of ASTE, by another president. Each former chief executive tells, in his own way, what he thinks is significant. It's good solid reading, and valuable, to "him who thinketh."

O. B. Jones

A. H. d'Arcambal, Vice-President — Consulting Metallurgist of Pratt & Whitney, Div. Niles - Bement - Pond Co., Hartford, Conn., was sworn in as President of ASTE at the Annual Dinner of the Society in New York, March 8, 1940.

"Dark," as he is popularly known, was elected to the highest office in the Society by its Board of Directors because of his engineering education, experience and ability. They recognized him as a big man, going places, and decided to harness him to ASTE for a year.

Prediction Fulfilled

Someone, writing in *The Tool Engineer* about this time, said: "There's no stopping ASTE with 32 operating Chapters and a membership of nearly 5,000, all in less than eight years. The American Society of Tool Engineers is the fastest-growing technical society in the world."

Men who say such things know something about the spirit of a tool engineer. They aren't talking to give him encouragement. They know he is one type of individual who doesn't need that. Management doesn't dare encourage him. A tool engineer has learned, long since, that if he can't prove to management by figures that his dream is possible of reduction to actualities, he must dream a new dream.

The spirit of a tool engineer is something difficult to define. The word "dogged" fits fairly well, but doesn't go far enough. The spirit of a hound is, however, more easily depicted, though volumes have been written in an endeavor to do justice to its flame.

Canine Perseverance

A mongrel, lop-eared, dumb-looking, soulful-eyed hound will follow the scent of a rabbit over stones and through briars until its feet are bruised and bleeding, its ears torn to shreds of raw, throbbing flesh. A hound pup will yip on the trail of a rabbit long before it has ever seen one. It knows instinctively what's at the other end of the trail. That's FAITH!

A tool engineer knows what's at the end of a trail, too. The chase goes on. But enough of philosophizing, let "Dark" relate his impressions of the Society before and during the immediate prewar year:

"In the Spring of 1935," 'Dark' recalls, "I received an invitation to address the American Society of Tool Engineers, located in the dynamic city of Detroit, my old home town. I had not been aware that such a society existed, but being intrigued with the name, I gladly accepted this invitation.

"The type of men attending this meeting and their businesslike method of conducing the affairs of the Society so impressed me that I filled out an application blank for membership at the close of the meeting.

"At that time there were no Chapters outside of Detroit, but it was not long before Racine became the second Chapter of the Society, closely followed by Cleveland, Milwaukee, Chicago and Bridgeport.

Home Chapter Flourishes

"In the Fall of 1936, a group of tool engineers in Hartford formed a Chapter in their city, the late Ford R. Lamb, to whom our Society owes so much, presenting the charter to an initial membership of 25. Today, the Hartford Chapter membership is well over 500, and constitutes without doubt the finest Chapter in the country. (Yes, I'm from Hartford.)

"One of the most interesting and busiest years of my life was during 1940-41 when I had the honor of serving our Society as its President. At the time of my election, we had less than 4,300 members located in 32 Chapters in this country and Canada.

"In those days the President was expected to visit every Chapter in the Society, as well as, of course, attending the Semi-Annual and Annual Meetings, together with several meetings of the Executive Committee.

Charters Nine Chapters

"Another duty, and a most pleasant one, was the chartering of new Chapters. During my term we formally launched Chapters in Boston, New York City, Binghamton, Columbus, Indianapolis, Grand Rapids, Seattle, Springfield, Vt., and New Haven.

"I shall always remember Ford Lamb's surprise when we chartered Twin States Chapter at Springfield, Vt. When Ford discovered that that community could not be reached by railroad, he wondered if it could ever support a Chapter.

"The records show that 75 men, all holding responsible positions in that area, signed up as charter members, doubling their numbers in a short period of time. Ford was almost too surprised to enjoy his nightcap in the famous underground cocktail room, reached by a tunnel from the Harkness House, in that city without a railroad.

"All of the Chapters chartered that year have made splendid progress, and it is always a pleasure to revisit these groups founded in my administration.

Visits Many ASTE Groups

"During my service in the presidency, I succeeded in visiting over twenty of our Chapters, usually first meeting with the Executive Committee before dinner, then giving a technical talk after saying a few words on Society matters. After the meeting, I would dash to the railroad station to make the midnight train for the next Chapter town on my itinerary. On returning home from one of these strenuous trips, I did not find it necessary for anyone to rock me to sleep.

"Our third Machine and Tool Progress Exhibition held in Detroit the week of March 24, 1941, was a huge success. The Exhibition got off to a flying start with a very successful preview dinner honoring the "brass hats" of the automotive industry, several hundred attending this function in Convention Hall.

"All of the exhibitors did themselves proud both in quality of products exhibited and attractiveness of booth arrangements. The exhibit hall was jammed day and night, many visitors coming from foreign countries.

"Our Annual Dinner that year was held at the Book-Cadillac Hotel in Detroit, with an attendance of more than 600. Seated in the office in my recreation room, gazing at the picture of this banquet gracing the wall, I cannot but smile recalling what happened to my carefully-prepared notes for that evening.

"The first speaker was a comedian who posed as a prominent tool engineer from abroad. Concluding his remarks, he unwittingly retrieved, along with his own notes, my laboriously-developed outline of the evening's program before returning to his seat.

Operation Sheets Destroyed

"When I discovered my papers missing, I walked over to the 'foreign gentleman' from the United States, accompanied by an F.B.I. man who was our principal speaker that evening. Imagine if you can the shock I experienced on finding that he had torn into bits all of my notes as well as his own.

A.H. d'Arcambal

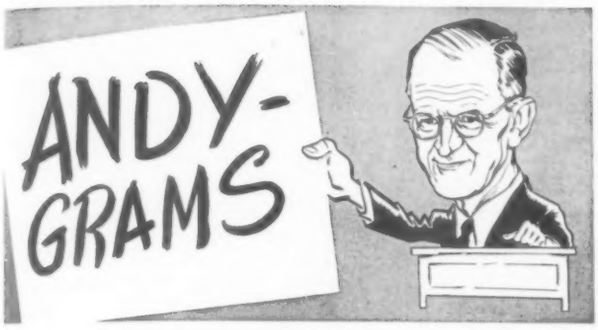
"From that moment on I tried to conduct this important annual dinner meeting without benefit of notes. At this late date, I humbly apologize to any of the notables who were not properly presented to the members and guests of our Society that eventful evening.

"It was a real pleasure to announce at this memorable banquet that our membership had increased almost 50% during the year, with 5,800 members in good standing. Should anyone have predicted that evening that, within five years, we would have over 70 Chapters, with a membership of close to 20,000 good and true tool engineers, his sanity or sobriety surely would have been questioned.

"Credit for this unprecedented growth goes to our National Officers, Directors, Chapter Officers and Committees who have served since my term in office.

"It was, indeed, a most interesting and happy year that I was privileged to devote to our Society as its President. The many real friendships made while visiting Chapters from coast to coast and attending Directors' meetings, were alone worth the months of personal time devoted to the affairs of the organization.

"To the handful of men who founded ASTE in 1932, we owe a debt which never can be paid. These men of vision, our original charter members, have given unsparingly of their time and personal funds to build an international organization servicing tool engineers and their companies throughout the world. Long live the American Society of Tool Engineers!"



WELL, HERE I AM, snugly ensconced in a log cabin at Lake Manistee, having finally made good on the promised vacation—my first since Uncle Sam took a hand in the Big Fracas. And, I just ain't doing nuthin' but laze around. No telephones, no newspapers, no radio to remind you to take little liver pills for your tummy's sake. Just peace and quiet, with nothing to worry about except getting out the Column ahead of the September deadline. Wonder what day it is? And what the heck am I going to write about when there's nothing doing? But, here goes, hoping for the best now that I've got started.

Lake Manistee is in the heart of what once was Michigan's lumbering empire. Now, erstwhile giants of the forest lie rotting in a tangle of undergrowth and second growth timber. The forest primeval, second generation. The wash of waves, from prevailing westerly winds, has so undermined the east shore that uprooted trees either lie horizontal over the water or form an impenetrable barrier against landing. One breathes the tang of conifer and birch, and the woods are so thick that a novice woodsman could get lost within a hundred yards of the cabin.

Rowing along in the deepening twilight, saw a trio of deer come down to drink. Aware of our nearness, the buck raised the flag, and off they went! Swallows, martins and whip-poor-wills busily decimating insect pests. Waterfowl silently winging their way to rest, the mocking laugh of a loon; a brace of helldivers vieing in underwater endurance tests. A breath-taking sunset and, ablaze with jewels, a seductive Venus beckoning in the western sky. A full moon looming hugely red in the east, later strewing woods and water with a silver sheen. Mischievous Echo mocking us in the offing. An hour with a book, reading by the soft glow of kerosene lamps, a game of rummy with the silent partner, a nightcap of coffee and so to bed. Tomorrow, another day.

Up betimes and down to the lake for a dip. Brrrr! Warmer toward noon. A tramp through the woods with the dog, the pooch revelling in unwonted freedom and the lure of animal scents. In a clearing, a tangle of briars laden with blackberries and, alongside an overgrown logging trail, a patch of blueberries. I'll save them for the wife; she'd rather pick berries than eat 'em. A porcupine clacking on a stump . . . come here, pooch! Whoa! Stopped you in time, eh? Wanna get a snootful of quills?

The vacation provided opportunity to try out some of my old guns, so I took a passel of 'em along. Also, a Winchester 22 target rifle, property of my young nephew Carl Bjorklund who, incidentally, is an up 'n' coming tool engineer and a member of Detroit Chapter. And, from what I hear, ace marksman of the *Irish* Rifle Club. Anyway, he beat me to a frazzle a while back, and I used to be better'n fair to middlin' before taking to bifocals. Arrived at camp, started teaching my daughter, Betty, to shoot, and first thing you know she was centering 'em right in the pip of the ace of diamonds.

My big trouble was getting ammunition for the muzzle loaders. Some time back, though, I'd managed to get some black powder through the good graces of H. T. (Deacon) Sprott, from down Tennessee way. (Incidentally, I haven't paid the Deacon as yet a/c I wrote him asking that he include shipping charges, and he never answered. Sally,* remind me to mail him a check when I get back). Anyway, I had powder, but no percussion caps. Just before leaving, however, I located a source through Thos. Woroniecki, Bellport Gun Shop, Bellport, L. I., N. Y., and thanks to my Sec'y, these were eventually relayed to camp.

In the meanwhile, necessity became the mother of invention. I cut the tips off parlor matches and used them for caps, holding them onto the nipples with pieces of tin foil from tooth paste tubes. They worked swell!—never misfired once. And listen!—don't kid yourselves about muzzle loaders. They're slow, compared to modern cartridge guns, but for real sport I'll take 'em any time. In this connection, the Kentucky rifle, cap or flint lock, still stands as one of the most accurate of shoulder arms.

Among other guns, took along a Springfield 45/70 carbine, for which I had ammunition. But, a streak of caution overcoming the familiarity (with guns) that breeds contempt, I strapped it down on a cricket for the trial shot. And just as well, since the cartridge case tore apart, when the gun kicked back hard enough to break a heavy leather strap used to snub the recoil. And oh, what a hole the slug made in a log used for a target! Anyway, I pulled the slugs and reloaded with birdshot, when the gun served for skeet.

Well, so much for *local color*. Of course, I realize that you boys North, East, West, South ain't particularly interested in my vacation. But, I also realize that few men can resist the lure of the woods and the acrid tang of burnt powder (face powder a possible exception) and I've just outlined the things I've seen. A few days more, and I'll be back to the daily grind and a two weeks accumulation of mail which I'll answer in due course of time.

Not that I'm worrying about the office. As you will see by the masthead, we've added an *editorial associate*—Fred W. Steiner—to our staff, and the lad is taking hold in grand style. When I see him busy from start o' day to quitting time I wonder how I ever survived the preceding eighteen months. But then, his work is showing results in a better book—"every day, in every way, we're getting better and better," as ol' Doc Coue said.

Just before leaving town, had a brief confab with W. B. McClellan, who is doing a swell job as Ch'man of the Nat'l Editorial Com'tee. I understand that the Committee will meet during my absence, as a result of which I'll miss meeting the rest of the boys, with some of whom I'm as yet unacquainted. Or am I? Anyway, another time. And now, I've got to get this mailed, so here goes a luxuriant crop of whiskers a/c I've got to make myself presentable before hitting civilization. In closing, I'll borrow a new *complimentary* from our progressive 1st Vice Prex. Brad Pierce, and sign myself

Yours ASTEely,

Andy

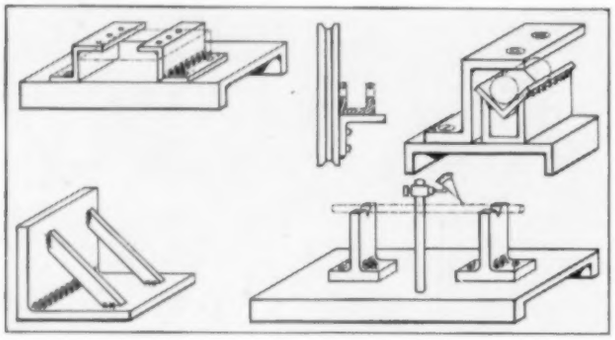
*My winsome and hard working Sec'y.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Structural Steel for Fixtures

MANY FIXTURES—and especially those used for short production runs—can be quickly and economically made from structural shapes, as angle iron, channels, Z-sections and I and H beams. These shapes are uniform, lend themselves admirably to welding (when they should preferably be normalized) and to machining.



The variety of fixtures which may be fabricated from these shapes is almost endless, and the ones shown merely suggest a few types. No locking or clamping devices are shown in the illustrations, as these would have to be designed for the job. While welding is the less costly means of joining members, these may be screwed and dovetailed in place, in which case the mating surfaces should be previously machined.

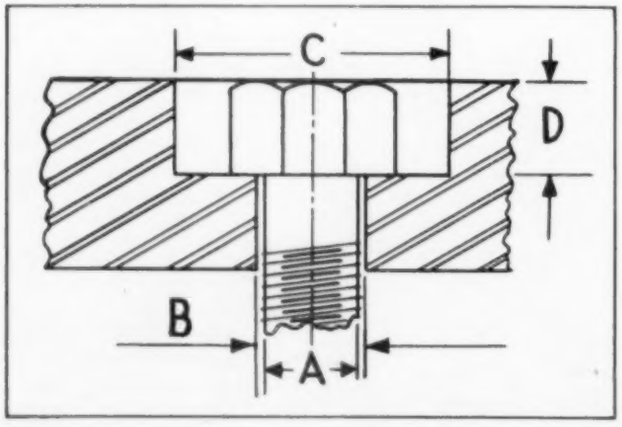
Frank J. Peragine
Greater New York Chapter, ASTE

Also, by Mr. Peragine, a

C'Bore Table for Standard Socket Wrench Clearances

THE FOLLOWING TABLE will be helpful to tool designers and toolmakers alike, in determining adequate clearance for socket wrenches used in connection with hex head screws and bolts, when these are set in counterbored holes.

The table, in which "A" is the diameter of the bolt, "B" the suitable hole clearance, "C" the counterbore diameter (based on U.S.S. heavy nut type), and "D" the depth of counterbore less thickness of washer, is made up from a careful check of the various socket wrenches in common use.



FOR HEX HEAD SCREWS AND BOLTS

A	B	C	D
1/8	5/32	5/8	1/8
3/16	7/32	13/16	3/16
1/4	9/32	7/8	1/4
5/16	11/32	1	19/64
3/8	13/32	1 1/4	11/32
7/16	15/32	1 3/8	25/64
1/2	17/32	1 1/2	7/16
9/16	19/32	1 5/8	31/64
5/8	21/32	1 3/4	17/32
3/4	25/32	2	5/8
7/8	29/32	2 1/4	23/32
1	1-1/16	2 1/2	13/16
1 1/8	1-3/16	2 3/4	29/32
1 1/4	1-5/16	3	1
1 3/8	1-7/16	3 1/4	1 3/32
1 1/2	1-9/16	3 1/2	1-3/16

SQUARE HEAD BOLTS

1/4	9/32	1 1/8	1/4
3/8	13/32	1 3/8	11/32
1/2	17/32	1 3/4	7/16
3/4	25/32	2 1/2	5/8
7/8	29/32	2 3/4	23/32
1	1-1/16	3	13/16
1 1/8	1-3/16	3 1/4	29/32
1 1/4	1-5/16	3 1/2	1

Winding on Small Cores

A MANUFACTURER, having to wind fine insulated wire on to a spool used in a delicate electrical recording instrument, ran into difficulties when the winding shorted. The core of the spool was only 1/16" in diameter, and the wire (enamel coated) was about 3 mils—i.e., .003" in diameter. Exhaustive tests failed to disclose any flaws in the wire or breaks in the insulation, yet, practically every spool had to be rejected when subjected to final tests.

The problem was referred to an "old timer" tool engineer, who dug out the answer from his store of experience. "Your trouble is due to the sharp bending of the wire in the first few lays," he said. "Run the wire through a pan of hot water, then, dry it with a blast of hot air between the pan and the spooler. That will soften the insulation and prevent cracking." The idea was tried out and no further trouble was encountered during the run of the job.

Contributed

Drilling and Boring Tools

Installment No. 2 of a Series

IN THE PRECEDING (introductory) installment, of this Series, we gave a historical outline of the development of drills. Such historical accounts will follow as later developments are discussed. For example, we stated that twist drills, in crude form, dated back several centuries; however, the milled twist drill was not introduced until about 1863, when Stephen Morse, a native of New Hampshire, was granted a patent on a Milled Twist Drill.

Morse had learned watchmaking and grew up in an atmosphere of engineering. Later, becoming interested in gun making, he saw the necessity of a drill that would not only clear the chips in deep hole drilling, but which would produce a better hole. Thus, as with many other things, the art of drilling was accelerated by the demand for arms in large quantities and with uniform parts dimensions essential for interchangeable assembly. Morse eventually developed a special machine for milling the helices, and formed a company—the Morse Twist Drill & Machine Company—for the manufacture of twist drills.

Carbon steel drills, milled from the solid bar, prevailed until the advent of High Speed Steel toward the turn of the present century. From then on, there was accelerating improvement, not only in the quality of the drills, but in the evolution of fixtures, jigs, drilling machines, bushings and accessories.

Today, two methods are generally employed in the manufacture of twist drills. One is to mill the helices or grooves in the solid bar, while the other is to hot forge the grooves in bars and to twist them to the required helix. The hot forged and twisted bars are then welded to alloy steel shanks. The flutes, however, are subsequently finished, and in all other respects the forged drills are processed very much like those milled from the bar.

Deep Hole Drilling

While gun barrel drilling and finishing, involving modern techniques, will be discussed in a later installment, a few preliminary comments are prompted by the reference to Stephen Morse, above. Two methods for deep hole drilling (analogous to gun barrel drilling) are shown in the two illustrations below.

A consideration, here, is that a long twist drill will not, as a rule, drill a straight hole. There will be some deviation from the longitudinal axis as the hole deepens, although this can be considerably reduced as a result of careful workmanship and certain preliminary precautions. In deep hole drilling, the work is preferably rotated, as in a lathe, with the workpiece carefully trued in the chuck and the free end supported in a steady rest.

The hole is started with a center drill, and a drill somewhat smaller than the long drill is then run in to a depth several times that of the diameter—say at least 3 to 1. This starting hole is then bored to the O.D. of the long drill, when it serves as a guide bushing. For that matter, a guide bushing—preferably of the rotary type—may be mounted ahead of the hole. This will not obviate the initial bore, as suggested above, but it will aid in supporting the long drill and will therefore tend to produce a straighter hole.

The hole is then drilled through to the end, after which the starting end is chamfered 60°. The workpiece is then removed, and the exit end of the hole chamfered 60°. The workpiece is then mounted between centers and a cut taken off the O.D., both ends, to compensate for any deviation. The workpiece is then rechucked and carefully trued, with the starting end held in a steady rest, as before.

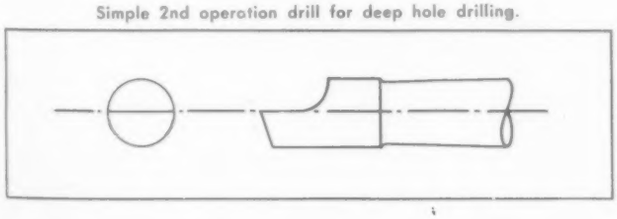
The hole is then redrilled, using either of the two types of drill shown below. The first step, in redrilling, is to bore a starting hole, as previously described, to a depth several times the O.D. and to diameter the exact size of the drill, plus a minimum clearance to prevent seizing. As in the case of the first drill, this prebored hole serves as a guide bushing—and, it may be noted here, no leader bushing is required for this operation.

While the shank of the drill shown at left, below, is somewhat reduced, to prevent binding, the cutting head should be the exact size of the hole which it is intended to drill. It may have a slight radial relief, from the cutting lip, and some side clearance, to prevent drag; however, the body diameter must be round and to hole size.

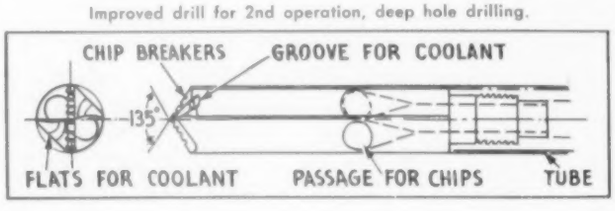
In drilling, care must be taken not to force the feed to a point where the drill will spring or bend. It is progressively advanced and retracted, to clear chips (a blast of air, from the spindle end, will serve to expel chips) until the hole is drilled clear through. With careful handling, the bore should be true with the O.D. A groove can be milled, in the body, for passage of coolant; however, the drill shown will serve for cast iron, brass or bronze.

The drill shown at the right, below, is of the type used in modern gun barrel drilling, and is inserted in a tube. The latter also serves as a duct for coolant, which is directed to the cutting lips by means of the oil holes shown. This drill is much faster, in operation, than the one previously

Simple 2nd operation drill for deep hole drilling.



Improved drill for 2nd operation, deep hole drilling.



The Jet Drill, manufactured by the Republic Drill & Tool Co., Chicago, Ill. Above, the various components of the system. Upper left, in photo, the outer shell of the bushing and, immediately at right, the rotor, which serves the triple purpose of guide bushing, inner race and chip breaker. Note the cutting lips which break up the chips as they are forced out along the grooves.

The smaller photo, at upper right, shows the complete bushing assembly, with the drill in place. The drill is 4-fluted, two of the flutes serving as coolant ducts. The hole, shown in the O.D. of the outer shell, is for entry of the coolant. At right, the Jet Drill in action.

described; either, however, serves as an intermediate tool for semi-finishing prior to reaming and final finishing. It may be added, in this connection, that several drills, each longer than its predecessor, may be used in deep hole drilling. Such "stepping" serves the dual purpose of shortening advance and retraction, in drilling, and to reduce the spring-back which is inherent in extra long drills.

Hyper Drilling

Apropos deep hole drilling, there is the recently developed Jet Drill, manufactured by the Republic Drill & Tool Co., Chicago, Ill. A system of *hyper drilling* rather than a tool *per se*, the method employs a jet of coolant, under high pressure, to cool the drill and to aid in forcing out the chips. The drill is guided through a precision, rotary ball bearing bushing, with drivers engaging the flutes of the drill so that both drill and bushing run in unison. A seal of synthetic rubber, at the top of the bushing, prevents escape of coolant so that it is diverted to the work.

Instead of enclosed coolant holes, the drill incorporates open channels which are first sealed, on the O.D., by the bushing, and then by the hole itself as the drill penetrates. In drilling, then, the coolant is forced, under pressure, along the channels and to the cutting edges. Because the seals prevent the fluid from backing up—except as a negligible amount may escape—it can only return through the main flutes, forcing the chips along with it.

So that the chips may not wedge, the inner race of the bushing is provided with cutting lips. These break up curling chips, which are expelled through wide openings in the outer shell. See illustrations. With the Jet Drill, holes may be drilled in both ferrous and non-ferrous materials at speeds and feeds far in excess of rates previously attainable. To date, it is the fastest known method for both shallow and deep hole drilling.

Continuing on deep hole drilling, we have the inserted blade flat drill, shown at left, below. While this does not

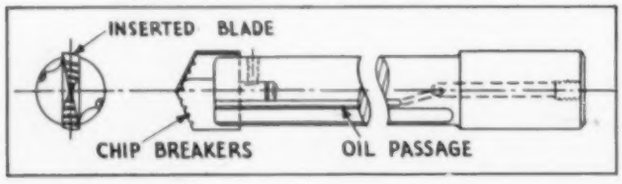
lend itself to the accuracy of the tools previously described, it may be advantageously used for comparatively deep holes in turret lathe and similar operations. Here, it has the advantage that the shank diameter may be made to suit the holes in the turret—or to suit an adaptor or holder—while interchangeable blades may be provided, both for replacement and for different sizes of holes. Note the coolant ducts, and the serrations in the blade, which serve as chip breakers.

While various tools are used for finishing the bores of deep holes—that is, finishing prior to honing, if such is required—the tool shown below has the advantage of simplicity and good performance. Two opposed blades are used, and the tool is guided by means of packs, which may be impregnated hardwood or other material which will not score the walls. This drill, too, is of the inserted type, and is used much in the manner of the drills previously described.

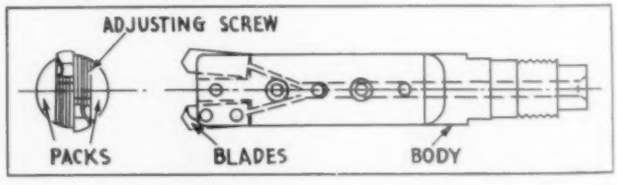
One method of deep hole drilling, in which the work is held stationary, is to invert a drill press so that the drill is below and the work held in a fixture clamped to the column. Drilling is then done from below, as a result of which the chips may be cleared by gravity, or by a blast of air from above. Incidentally, coolant may be directed to the cutting edges, from above, for the second operation after the initial hole has been drilled.

End of Part 2. Installment No. 3, this Series, will follow in the October issue, The Tool Engineer.

Inserted blade cutter, for use in Turret Lathes.



Inserted blade cutter, for final finishing of deep holes prior to honing or subsequent finishing.



GOOD READING

A Guide to Significant Books and Articles of Interest in the Trade Press

MANUFACTURE OF SURGICAL INSTRUMENTS, by Floyd McKnight & Joseph G. Cowley in August 5, *Steel*, shows how modern machining and heat treating methods are effectively combined with hand craftsmanship in the production of forceps and scissors, through the various steps of drop forging, machining, milling, filing, trimming, grinding and finishing.

Also in *Steel*, August 12 issue, **TOOL ENGINEERS' HOLIDAY,** by Guy Hubbard, good-naturedly reports how 100 Tool Engineers, Cleveland Chapter, spent a busman's holiday at one of the local country clubs. The story, appearing in his article, "Seen and Heard in the Machinery Field," tells how Mr. Hubbard lunched with members who drew sketches of machine tool set-ups; joined a foursome of golfing salesmen who were selling carbide tools to one another; visited the taproom to hear a discussion on a new razor blade machine; and ate his dinner, with his partner to the right pondering the subject of punches, and the gentleman to his left deep in plans for an article on heat treatment of tools.

For all the lack of games, Mr. Hubbard thoroughly enjoyed the outing and concludes that Tool Engineers do play hard at one particular kind of a "game," and that is their profession—tool engineering.

ORGANIZING FOR QUALITY CONTROL, by Eugene Goddess, in August *Mill & Factory*, defines quality engineering as "responsible for the quality of incoming material, the final product, the various processes, the establishment and maintenance of physical standards, and the status of specifications."

The author, Head of Factory Engineering for North American Philips Company, believes quality engineering costs which add directly to the quality of a product (such as a quality inspector at the end of a production line) should be budgeted to direct labor, and never charged off as indirect costs.

Mr. Goddess further believes the level of quality that management wishes to attain is the determining factor insofar as the final size of a quality control department is concerned.

SUPERSONIC INSPECTION OF MATERIAL, by H. R. Clauser, in August *Materials & Methods*, reports on two types of high frequency sound waves—above the range of human hearing—for non-destructive testing to detect flaws such as voids and inclusions in solid pieces of material. One inspection method involves reflection of sound waves while the other is based on the through passage of the waves. Up to 28-ft. lengths of aluminum and steel have been successfully tested, but such supersonic methods are ineffective when over three inches of bakelite are to be inspected.

In one special testing set-up, defects in material as slight as 0.001" internal air film have been detected. Such supersonic inspection seems destined to supplement rather than take the place of radiography, although where either method could be used it seems likely that supersonics will be chosen because of the lower operating costs.

Also in the same issue, **POWDERED METAL VS OTHER HIGH PRODUCTION METHODS,** by Herbert Chase, is a definite attempt to help the engineer in making a proper choice of method for producing small parts, by pointing out advantages and limitations of powder metallurgy and its most competitive rival processes. Methods compared include sand casting, stamping and die casting, and screw machine production.

Among the points of comparison are materials, relative costs and properties, size and weight limitations, rates of production, tooling costs, shape limitations, scrap losses, dimensional limits and smoothness of surfaces.

ROLL GRINDING, a new 54-page booklet of the *Norton Company*, Worcester 6, Massachusetts, tells the interesting story of the grinding of many kinds of chilled iron and high grade heat treated steel rolls, ranging from the large hot mill rolls—in sizes from 10" to 30" diameter by 12" to 98" length of body—used for hot working of steel in strip, sheet and tin plate mills, on down to the grinding of certain jewelers' rolls—measuring only 5" in diameter and 8" in body length—which are used for reducing strips of precious metals to required decimal thickness.

Points to remember in selecting the correct wheel for roll grinding are also included in the attractive booklet, as well as important factors affecting roll grinding results. There is also much miscellaneous information, such as the work involved in preparing and dressing copper surfaces of rolls used in rotogravure presses.

INVOLUTOMETRY AND TRIGONOMETRY, a 321-page reference book for gear engineers, compiled by Dr. Werner F. Vogel, Associate Professor of Engineering, Wayne University, Detroit, has just been published under sponsorship of *Michigan Tool Company*, Detroit.

Main topic of the book is the relatively new science of involutometry which concerns itself with the involute of a circle and surfaces containing a multitude of such involutes. The simplest definition of an involute of a circle is contained in the "string method" of involute generation. "An involute," says the author, "may be generated by unwinding a tightly held inextensible thread from a fixed circle, called base circle. If the thread is extremely thin, each of its points describes an involute."

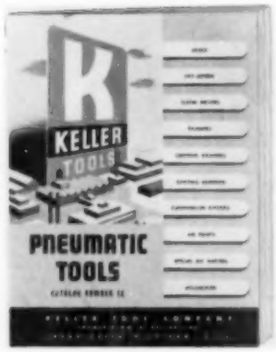
Dr. Vogel, author of the book, has tabulated special involute functions, thus permitting replacement of the classical equations of the involute by simpler formulas. A detailed explanation of how to use the book to work the many sample poblems is included and should prove invaluable, especially for those not too familiar with the subject.

The book is sturdily bound in an 8" x 11" size, priced at $20, and is divided into one main table and three appendices. The main table—comprising more than half the total pages—is a complete seven-place table of trigonometric functions, and can be used like any other trig table, as well as for involutometry.

The appendices include a number of reference tables and a system of involute tracing tables which, it is claimed, may revolutionize prevailing lay-out methods of involutes, at enlarged scale, because it permits a great increase in the scale of enlargement as well as making for accuracy and convenience.

BULLETINS AND TRADE LITERATURE

Items briefed herein have been carefully selected for their interest and application. Unless otherwise stated, all are available, free, from the stated sources.



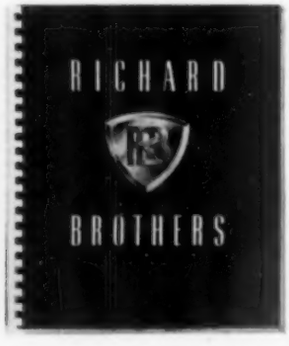
Number 12, a catalogue by **KELLER TOOL CO.**, Grand Haven, Mich., describes their regular pneumatic line, plus 14 new tools developed during the war, such as an air powered sawing and filing tool, an impact wrench and a lightweight air hoist in ¼ and ½ ton capacities. On-the-job photographs, capacity and specification tables, and ordering instructions are included.

Catalogue No. 46, released by **GEORGE F. MARCHANT CO.**, 1420 S. Rockwell St., Chicago, describes their complete line of punches, dies, couplings and rivet sets.

Statistical Quality Control in War Production, a 23-page reprint, released by **THE FOOD RESEARCH INSTITUTE**, Stanford University, Calif., recounts wartime developments in the application of statistical methods to industrial problems. Authored by Holbrook Working, and originally published in Dec. '45, *Journal of the American Statistical Ass'n*, the article also explains the solid foundation which industry and education have already established—on which it is hoped they will build future quality control research and instructional programs.

Metal Cutting Chart for Hacksaws and Band Saws, by **THE L. S. STARRETT CO.**, Athol, Mass., gives, on one side, essential information for using hacksaw blades correctly; on the reverse, the correct length and width of blade for any standard band saw machine. Additionally, the recently revised *Starrett Dial Indicator Catalogue* is now available, describing standard dial indicators, and including such products as inside and depth dial gages, vibrometers and cylinder gages.

Bulletin 5-45-R, a 66-page catalogue by **ENGINEERS' SPECIALTIES DIV'N**, *The Universial Engraving & Colorplate Co.*, 980 Ellicott St., Buffalo 8, N. Y., offers users of optical comparators and projectors 27 radius charts and discs, protractors and projector scales not offered in previous catalogues; as well as describing their line of engineers' glass for drawing and scribing and other associated products. Also available is a new insert—*Gaging with Optical Projection Comparators*—wherein the gaging of 18 dimensions in 15 seconds by optical projection is explained.



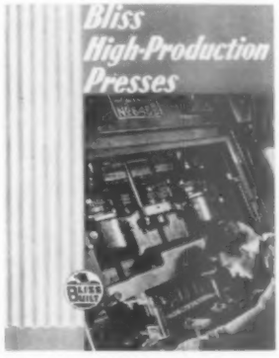
Edition FF, by **RICHARD BROTHERS DIV'N**, *Allied Products Corp'n*, 1560-74 E. Milwaukee Ave., Detroit 11, catalogues the R-B line of standardized interchangeable punches and dies, composite die sections, bushings, guide and dowel pins. Other products include socket head set screws, rubber strippers, cap screws, stripper bolts and punch retaining plates.

Bulletin No. FM-46, by **TUNGSTEN CARBIDE TOOL CO.**, 2661 Joy Rd., Detroit 6, describes "Vibra-Cushioned" carbide tipped face mills designed for face milling of steel.

Cutting Fluids, a booklet of the **D. A. STUART OIL CO.**, 2727 S. Troy St., Chicago 23, discusses types of cutting fluids, testing methods, and the function of sulphur and other additives. The material was authored by the company's President, W. H. Oldacre, who also contributed on a similar subject to the July, '46, *The Tool Engineer*.

Grinding Wheel Information, a 94-page booklet by **MIDWEST ABRASIVE CO.**, Owosso, Mich., covers the complete history of grinding wheels, and includes grain sizes, types and fundamentals of grinding wheel operation. Also available is a 32-page catalogue—*Mid-West Dependable Abrasives*—with information on coated abrasives, grinding wheels, honing and sharpening stones, sizes, weights, texture and prices, all especially written for salesmen, jobbers, or the top purchasing executive and engineer.

E. W. BLISS CO., 450 Amsterdam St., Detroit 2, has published a 21-page catalogue —*No. 27-A*—describing their "600 series" presses ranging from eight to 300 tons. All are engineered to automatically produce large quantity stampings requiring comparatively short and increased strokes per minute. Three coil cradles, to feed stock automatically, up to 15" wide, are also shown.



The Race Tester, by **PHYSICISTS RESEARCH CO.**, Ann Arbor, Mich., is a folder describing an instrument for production measurement of waviness in bearing races. The amplifier operates from standard 110-volt, 60 cycle power lines; and has a 220-volt, 60 cycle, 3 phase spindle drive ¼ hp motor.

NORTH AMERICAN PHILIPS CO., INC., 100 E. 42nd St., N. Y. 17, has published a folder, *Norleco Diamond Dies*, describing manufacture of indenture, cone and channel for diamond dies. Selection of quality diamonds, free from carbon spots and cracks near drawing surface, is explained, and the value of concentricity between cone, bearing and back relief emphasized. Also available, is a reprint of an article which first appeared in the *Iron Age*—"Geiger-Counter Used in Powder Metallurgy," detailing use of the Geiger-Counter X-ray Spectrometer, developed by the company, for making rapid intensity measurements of crystalline compounds.

Shot Peening . . . What It Means to You, a 16-page catalogue by **PANGBORN CORP'N**, Hagerstown, Md., explains how shot peening increases fatigue life of metals; and discusses such additional subjects as where shot peening can be used, the factors that govern successful application, and special descriptions of the process in a variety of metalworking applications.

By A. E. Rylander

Man-Au-Trol Spacer Insures Accurate Duplication

The Bullard Company Inaugurates a New Manufacturing Method

A SCANT YEAR AGO, the Bullard Company, Bridgeport, Conn., introduced Man-Au-Trol, an electrical "brain" which, controlling automatic cycles, converts standard machine tools into automatic machines. First applied to the Bullard Vertical Turret Lathe and the Horizontal Lathe, after several years of development, the principle is now applied to the Bullard Man-Au-Trol Spacer, a machine auxiliary which provides for accurate hole spacing.

The only thing lacking to make it a complete self contained unit is a spindle with driver, and that can be provided with almost any standard radial or floor type drill of adequate capacity. And while spindle accuracy is essential for spacing to close tolerances, it is not essential—although preferable—that the machine spindle itself be accurate. It need only serve as a driver for a precision, rigidly mounted auxiliary spindle. As shown, however, the Spacer is installed on a radial drill, the arm of which is secured to the Spacer by means of a guide post and bracket.

So mounted—and assuming spindle accuracy—the Bullard Man-Au-Trol Spacer provides for the accurate drilling, boring, reaming and tapping of holes, with operations accurately duplicated by simply setting a selector dial which controls work movement from one position to another. In most cases, the use of jigs is completely eliminated, thereby establishing a new precedent in the rapid and accurate positioning of work and spacing of holes without resort to jigs. Set-up time compares favorably with the time to machine one piece in either a jig borer or a horizontal boring mill—is faster, in some cases—and, on repetitive work, drilling time is considerably reduced.

Controls Easily Accessible

Tersely described, the Man-Au-Trol Spacer comprises a table mounted on a saddle, the table hydraulically movable transversely and the saddle, also hydraulically operated, movable longitudinally along the bed. The table is provided with algebraically designated stops, with the transverse dial located directly in front of the operator. This dial may be instantly set to establish different hydraulic circuits so that the table will move transversely in either direction to the exact position desired.

As an example: Assume that stop "C" (among several) has been previously set to transversely locate the table 8.000" from its extreme forward position. Then, whenever it is necessary to locate or relocate the table to this position —i.e., 8.000" from extreme forward position—the transverse dial need simply be turned, clockwise or counter-clockwise, to position "C." The table will then move, forward or backward as the case may be, at a speed of 10 ft. per minute (depending on its initial location) and will stop at the exact required position. Once stopped, the table is automatically locked, hydraulically, so that no subsequent force can move it until the work done at that station has been completed.

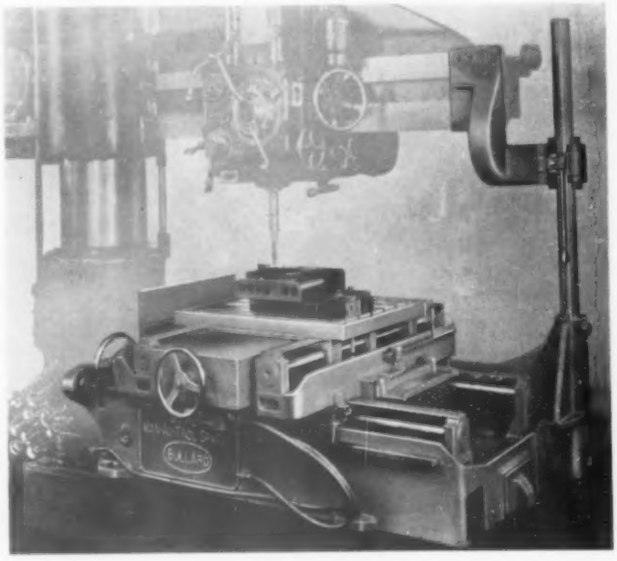
The saddle, in turn, is provided with numerically designated stops. The longitudinal dial, located slightly to the left of the operator, may also be instantly set to establish different hydraulic circuits so that the saddle will move, longitudinally, in either direction, to the predetermined position established by dial selection and the setting of the stop.

Again, an example: Assume that stop No. 14 has been previously set to longitudinally locate the saddle 6.500" from its extreme right hand position, the longitudinal dial is turned, in either direction, to position 14. As in the case of the table, the saddle will then move at the rate of 10 ft. per minute (also depending on its initial location) either to the right or left, and will stop at the exact desired position. It will then be automatically locked, hydraulically, and will so remain until the operation at station 14 is completed.

From the foregoing, it will be seen that the algebraic and numerical designations on the dials, respectively, are coordinated with corresponding designated stops, and that turning the dials to any designated position will automatically position the work to any desired location. In other words, both the table and the saddle may be moved to any position or ordinate by the mere turning of either or both of two dials, and once positioned, the slides are positively locked. It is not even necessary to accurately set the dials, as an error of $\frac{1}{16}$" either way will in nowise affect the accurate positioning of the table.

Compared to jig drilling, the Man-Au-Trol Spacer is a time and cost saver, whether the job consists of drilling one workpiece or many. And, once a pattern of positions has been established, it can be filed for future use. Because the operator may complete drilling of all holes, with exact duplication and without handling of work once secured in the holding fixture, and may then bore, ream or tap all holes in turn, with minimum changing of cutting tools, fatigue is reduced to a minimum.

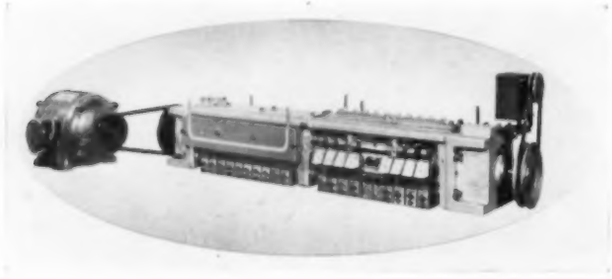
Furthermore, control of quality is enhanced, and inspection time reduced, because of accurate duplication. To all this, may be added the savings resulting from a general elimination of jigs, and the advantage, in cost accounting, resulting from the fact that cycles are automatic and constant and may therefore be accurately timed. Apparently, the Bullard Company has evolved something more than a mere mechanical unit; it has initiated a new manufacturing method.



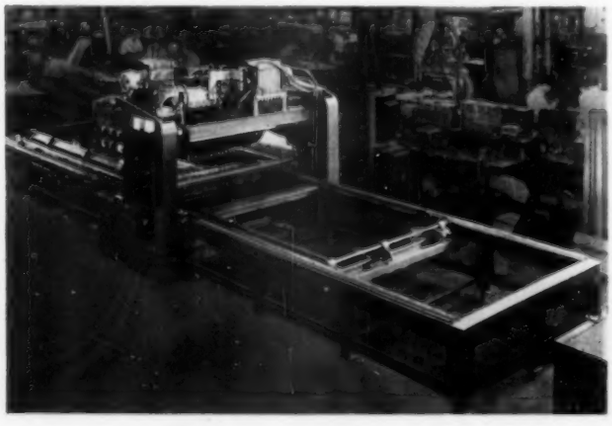
TOOLS OF TODAY

Ultra-Speed Welder

A NEW WELDER control unit—called **ULTRA-SPEED**—by *Progressive Welder Company*, 3050 E. Outer Drive, Detroit 12, is designed to meet increasing demand for fully automatic multiple-spot resistance welding machines capable of producing a large number of joints quickly and in one operation. This machine control has reduced the practical production limitations of such machines to the time required to load and unload the parts and permits automatic assembly welding rates up to 900 shots per minute.



The unit is the heart of all new Progressive Ultra-Speed welding machines and directs the "program" of all such automatic multiple spot welders. It distributes welding current to single or group welding points, successively, by means of a screw driven carriage that depresses push rods to engage contacts, much after the manner of running a finger over a piano keyboard. At the same time, another element of the carriage engages adjustable stroke plungers to control, individually, the length of time the current flows for each weld. All welding points bear on the work simultaneously under welding pressure before the first weld is formed and remain until the last weld is completed. This eliminates the separate "squeeze" and "hold" time usually required for each weld; as a result 20, 50, 100 or more joints can be made in but slightly more time than the total of the individual "weld times"—all at a few hundreths of a second each. The welding guns can be arranged in single or multiple rows, circles, steps and curves, closely spaced or spanning the full width of large panels. Individual timing of each gun permits welding of different thicknesses of metals during one complete operation.



Synchronous Motor Welder

BY UTILIZING the inbuilt separate exciter of The Hobart Electric Drive Welder, *The Hobart Brothers Company*, Troy, Ohio, has produced a compact, high performing **SYNCHRONOUS MOTOR WELDER.** The unit is so proportioned that it can be started across the line and automatically synchronizes itself by the build-up of the separate exciter. Starting current is approximately the same as a conventional induction motor of the same hp capacity.

The motor, of this welder, is a Hobart Revolving Field Synchronous Type furnished with heavy squirrel cage winding to make easy starting as a conventional induction motor. Once up to speed, the exciter builds up and automatically applies correct excitation to motor fields.

New G-E Welding Compounds

STRIKE-EASY is a new compound, made by the Electric Welding Div'n of *General Electric Company*, Schenectady, N. Y., to aid in instantaneously creating and maintaining a metallic welding arc where low currents and small-diameter electrodes are used. Easily applied, the compound can be used on any metal with any type of electrode. Also, by General Electric, are two new **WELD-SPATTER-RESISTANT** Compounds. Known as Nos. 9951 and 9952, they are especially formulated for use in the field wherever weld spatter must be easily and economically avoided. In powder form, to be mixed with water, the compounds are identical except that No. 9951 is non-adherent and can be easily removed with a cloth or air blast. The other, semi-adherent, can be removed with a damp cloth or a stream of water.

Tweezer Spot Welder

DESIGNED FOR PARTS .0005" to 1/8" thick or round, a new **TWEEZER SPOT WELDING MACHINE,** by *Tweezer-Weld Corp'n,* 280 Plane St., Newark 2, N. J., consists of a cabinet (size of a small radio) in combination with a pair of insulated forged copper tweezers. It plugs into 115 v. 60 cycle power supply and is controlled by a foot pedal.

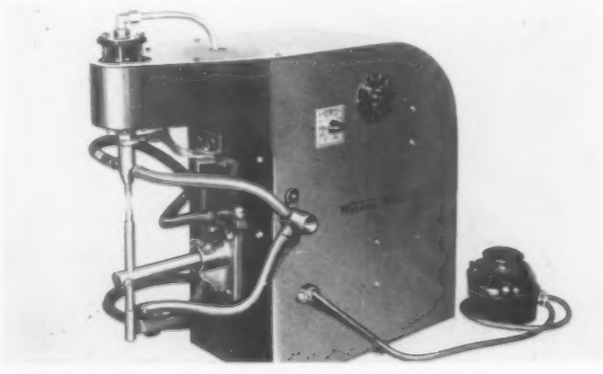
To weld, set the voltmeter, insert the work to be formed in the tweezers, apply pressure and step on the switch. For heavier work, electrodes may be mounted in a drill press or hand arbor and operated in the prescribed manner.

New Portable Arc Welder

A SMALL, portable electric Arc Welder, name **ZIPPER-ET,** is now available from *Mid-States Equipment Corp.,* manufacturers of the metal Zipper Arc Welder. The new device is patterned after the M-S DeLuxe Welders, and is especially recommended for light duty welding. It operates on 110 v. a.c. current and will handle rods from 1/32" to 3/32".

Weldex Spot Welder

A NEWLY IMPROVED, streamlined **BENCH TYPE SPOT WELDER,** measuring but 21" high, 10" wide and 23" deep, is announced by *Weldex, Inc.,* 7338 McDonald Ave., Detroit 10. Known as Weldex Model 263A, this new machine is a 3KVA, 220 volt, 60 cycle, single phase precision welder. It is air operated, foot controlled, electronically timed, provided with pressure switch and recommended for spot welding of light weight metals, as up to 16 ga. C.R.S. or equivalent. The machine has air dry enamel finish and weighs approximately 135 lbs. when ready to ship.



New Gleason Quenching Press

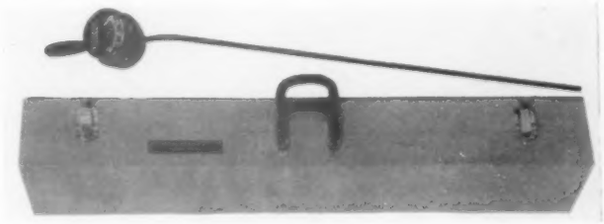
SAID TO BE a radical departure from conventional type of quenching, the new No. 16 **QUENCHING PRESS,** by *Gleason Works,* Rochester 3, N. Y., is designed for quenching heated gears, and similar work, so that they may be hardened without distortion. The part is clamped between upper and lower dies, for the quench, and oil circulation is carefully controlled. In the case of ring gears, for example, the dies are designed to round up the bore and to hold the gear flat.

Features include: (1) Metallurgically correct oil flow; (2) position control of the work during quench; (3) a built-in pumping system that provides an oil flow up to 225 gallons per minute with an external supply of only 35 gpm; (4) faster production; (5) safe, quick and easy changing of the work, accomplished by a lower sliding die mechanism which is automatically swung out from under the upper die when loading and unloading.

(6) Speedy set-up, as all controls for time and oil flow cycles are adjustable from the front of the machine, and (7) completely automatic quenching cycle that simplifies operations, cuts attendance time and insures uniform results.

New Portable Pyrometer

A NEW **PYROMETER,** manufactured by the *Roller-Smith Co.,* Bethlehem, Pa., is designed for measuring furnace temperatures, as well as the temperature of molten metals, chemical baths, lead and zinc pots, and for all cases where readings are needed in the 1200 degrees F. range. The instrument is built to withstand the normal strains of jars, vibrations, and other conditions incidental to service.



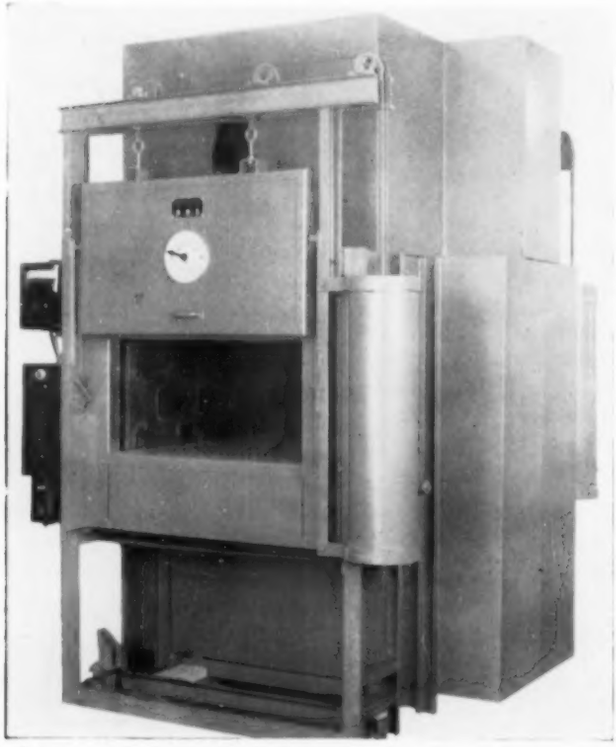
New Hand Pyrometer

THE XACTEMP PYROMETER is designed by *Claud S. Gordon Co.,* Chicago, for temperature readings of molten non-ferrous metals. It has 43" stainless steel extension and a standard 7" Marshall tip. This permits true readings to be taken below the surface of the molten metal. The indicator is provided with an Alnico V magnet and has a 3½" scale, reading from 50 to 2500 degrees F.

Magnesium Sheet Oven

A COMPACT, **PORTABLE FURNACE,** especially adapted to preheating magnesium sheet before forming, is a recent product of *Despatch Oven Co.*, Minneapolis 14. Being portable, it can be run from one press brake to another, as required, a feature that, among other innovations, is claimed to be unique for a unit of this type.

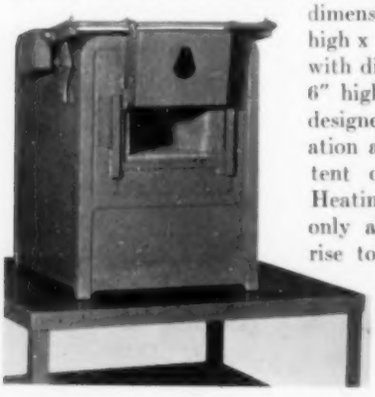
Of particular interest is the novel method of introducing the air, so that whether the sheet is flat, formed or partly formed, it will still be uniformly preheated. By means of automatic temperature control, the sheets can be brought out at exactly the right temperature.



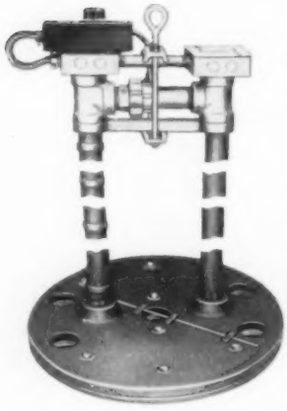
Midget Electric Furnace

TWO NEW optional features have been added to Cooley **MUFFLE TYPE ELECTRIC FURNACES,** manufactured by the *Cooley Electric Mfg. Corp'n, Indianapolis.* The standard furnace, manufactured with a hinged door which, when opened, forms a loading shelf, is now offered in an alternate design incorporating a counterweighted vertically operated door for particular use where only partial door opening is required.

These furnaces are supplied for heat treating tools, dies and small parts, also for laboratory testing, and are manufactured in two standard sizes—the MH-3 with chamber dimensions of 8″ wide x 6″ high x 14″ long, and the MH-4 with dimensions of 10″ wide x 6″ high x 18″ long. They are designed for continuous operation at 1750° F. or intermittent operation at 1850° F. Heating time to 1400° F. is only about 40 minutes, with rise to 1850° F. in 55 to 65 minutes. Usually operated with an Indicating Pyrometer, procedures may be accurately followed.



New Chromalox Heaters



TWO NEW Chromalox Electric Heaters, by *Edwin L. Wiegand Co.*, 7556 Thomas Blvd., Pittsburgh 8, include the **NOU** Modified **OVEN HEATER** designed to operate at oven temperature up to 950 degrees, and the Type D.H. **ELECTRIC IMMERSION HEATER,** designed to heat greases, solid oil and other compounds in 55 gallon drums.

The Oven Heater consists of fourteen high temperature chrome sheathed strip heaters, giving a combined rating of 8 kw. at 230 volts, single phase operations. The heating element terminals are centralized at one end of the assembly, with all electrical connections brought to a single enclosed terminal box to simplify wiring. The elements may be mounted to either the bottom or side walls of ovens; in the latter case, however, they are mounted at a slight angle to provide air circulation.

With the Immersion Heater, uniform heating results from placing the heater in the drum, where its weight causes it to settle rapidly, melting its way to the bottom without cold regions. It is available for 115 or 230 volt, single phase in ratings up to 5000 watts.

New Cooler Element

The National Radiator Company, Johnstown, Pa., has developed a new U-Cast Hairpin **COOLER ELEMENT.** The new unit is used for cooling any liquid, but is especially adapted for cooling acids or strong alkalies under extreme conditions that usually result in the solutions quickly attacking other metals.

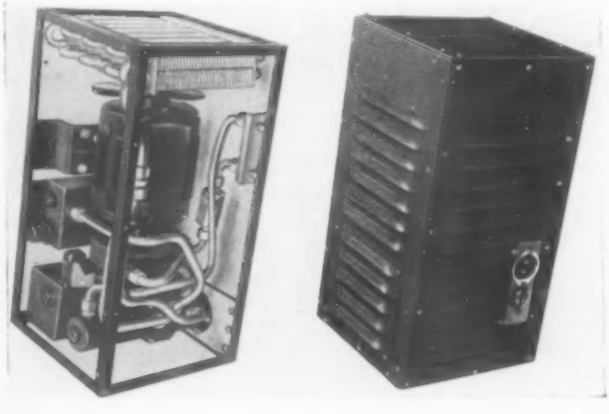
New Model "Y" Furnace

A NEW **MODEL "Y" FURNACE,** known as size No. 5, has a muffle chamber 7" high x 8⅞" wide x 20" deep. Through the use of larger sizes of Sentry Diamond Blocks, high speed steel tools up to 5" x 7" x 14" can be hardened completely free from scale.

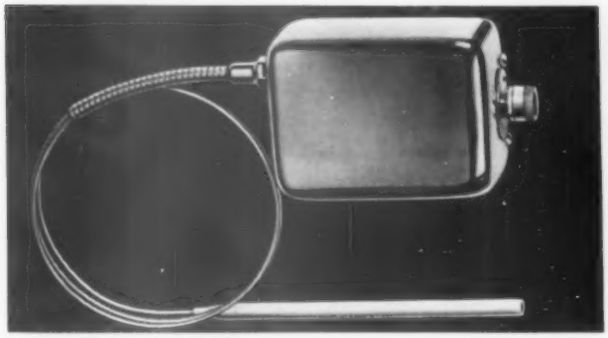
Several design innovations are incorporated in this new furnace by the maker, *The Sentry Co.*, Foxboro, Mass. Heating elements are located front to rear alongside the removable muffle chamber, with the heating element terminals of air-cooled type as used on other Model "Y" furnaces. The furnace heating chamber is designed to reflect heat toward the muffle chamber opening to offset the tendency to cool at this point. Terminals and electrical connections are shielded and protected by removable metal guards. The unit is rated at 42 kw and can be directly connected to 220 volts, 3-phase supply without a transformer.

New Heat Dissipating Unit

A **HEAT DISSIPATOR** for use in television, radar, short wave radio communication, high pressure mercury lamps, X-ray tubes, induction heating units and many similar products is available from the *Eastern Engineering Co.*, New Haven, Conn. The model shown will dissipate up to 1200 watts, with a constant controlled temperature, irrespective of surrounding temperature, within a range of 2 degrees C. This particular unit, size 16" x 7½" x 7½" is available in steel, bronze or aluminum.



Heat and Pressure Controls

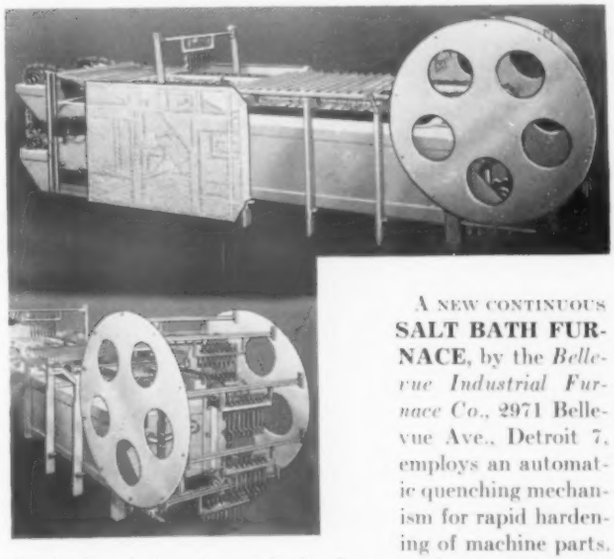


A LINE OF **ELECTRIC AND PRESSURE TEMPERATURE CONTROLS,** by the *United Electric Controls Company*, 69-71 A St., Boston 27, includes thermostats for control of heat, and electric pressure switches for control of gas and liquid pressures.

Typical of the former is the Type K Thermostat, for control of electric devices between temperatures minus 120° F. and plus 600° F. These units have approximate differential of .5° F. to 1° F. in liquids, sub-zero testing cabinets and mechanical convection ovens, and 2° in gravity type ovens.

A typical Pressure-Vacuum Switch has a range from 0 to 20 psi and 180 psi, and 30" to 0" Hg. Vac., and 30" Hg. to 20 psi. Bulletins, containing full information, are available on request.

Continuous Bath Furnace



A NEW CONTINUOUS **SALT BATH FURNACE,** by the *Bellevue Industrial Furnace Co.*, 2971 Bellevue Ave., Detroit 7, employs an automatic quenching mechanism for rapid hardening of machine parts. Originally designed and built for cyanide hardening the ends of control levers, the unit may be adapted for hardening almost any type of part with but minor changes.

A ferris wheel type automatic loader, located at the charging end, is equipped with metal pockets for holding specially designed fixtures which carry the parts. The pockets are so spaced and synchronized that they permit the fixture holding the parts to be placed in slots provided in the continuous chain. The chain travels the entire length of the machine, which includes the furnace and quench tank.

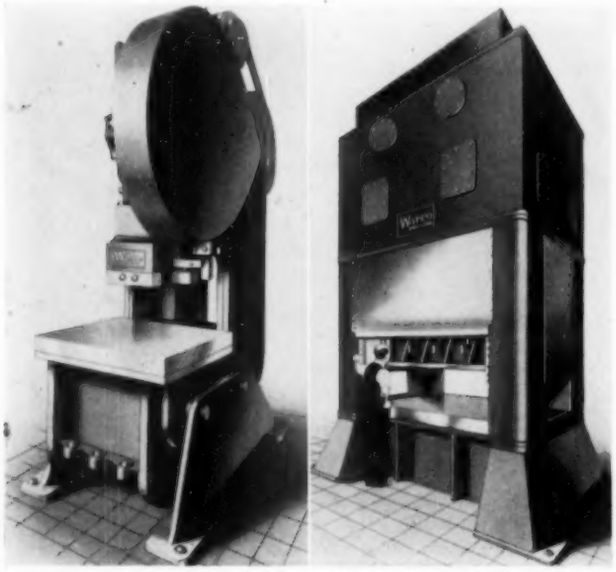
The quenching operation is completed within 4 seconds; however, a variable control drive permits changing the time cycle to suit parts going through the furnace. The machine can be provided with oil, water or hot salt quench tanks.

New Power Presses

PREVIEWED during the week of the recent A.S.T.E. New Era Exposition, in Cleveland, a new line of power presses, to be known as **"WARCO,"** is in project by *Warren City Mfg. Co.*, a subsidiary of Federal Machine and Welder Co., Warren, Ohio. Full scale production, in a huge, modern 87,000,000 plant, is expected to start within the next 30 days.

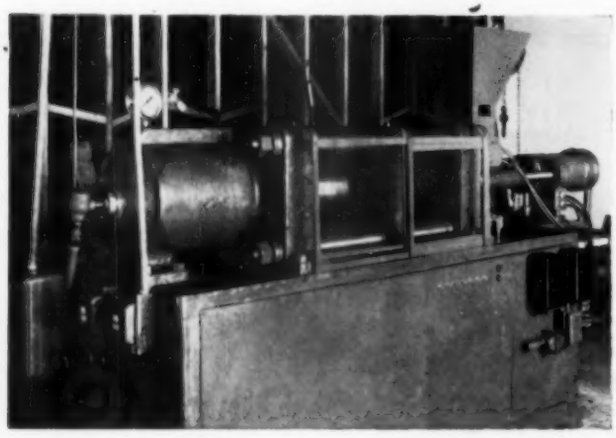
In project is a line of open-back, inclinable presses of 50 to 150 tons capacity, with stroke range 4" to 14". A typical Warco Press, of this type, is shown at left. These machines will be single geared and equipped with the latest type of pneumatic friction clutch and brake unit, air operated and electrically controlled.

Also, in project, is a line of mechanical and hydraulic metal working presses in capacities from 100 to 1200 tons, such as shown at right. These will be of eccentric gear type. Also contemplated, is a line of press brakes, in capacities from 100 to 500 tons, and in length capacities up to 24 feet. All machines will be welded steel construction.



Injection Molding Press

A SPECIAL electronically controlled INJECTION MOLDING PRESS for stainless steel, or any steel which can be brought to a melting point up to 4200 degrees F., is offered by *The Hisgen Machine Tool Works*, 2047 W. 94th St., Los Angeles, Calif. This new press is capable of injecting shots up to 15 lbs., and on heavy sections 5 cycles per minute are obtainable. It takes only 2 seconds to bring the material, with the induction heat, to the melting stage. Molded articles, produced by this method, have a high finish.

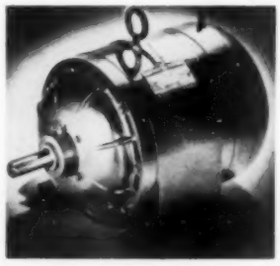


Centerless Lapping Machine

THE MODEL 100 **CENTERLESS LAPPING MACHINE**, just announced by *Size Control Co.*, Div'n of American Machine & Gage Co., 4636 W. Fulton St., Chicago 44, brings to industry an advanced principle of lapping for the precision finishing of cylindrical pieces. A precision finish of less than 2 micro inches is said to be easily obtained, with lapping time greatly reduced. One piece, or a hundred, can be easily lapped with no necessity for making set-ups, or using ring laps or other tools, as in the customary method of lapping.

The machine is furnished complete with ½ hp motor, ready to plug in, with a set of precision lapping rolls, lapping sticks, a jar of lapping compound and complete instructions. The cabinet is complete with coolant tray and lock. Bulletin 446 on the Model 100 Centerless Lapping Machine, including price list of reversible gage blanks, may be had upon request.

Enclosed Fan Cooled Motor

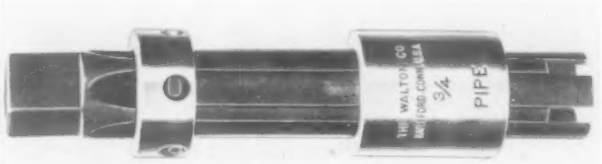


A NEW, TOTALLY ENCLOSED **FAN COOLED MOTOR**, especially designed for use in destructive atmospheres, has been added to *General Electric's* line of Tri-Clad induction motors. Available in standard explosion-proof and dust-explosion-proof types from 1 to 1000 hp, the new motor can be used where iron dust and metal filings are in the air, and in Class I groups C and D, Class II groups E and F and Class G hazardous locations.

Short and compact, the new Tri-Clad can be installed in a small space, as for machine tool applications where the motor must be part of the driven machine. It features a double shell, cast iron frame and a one-piece, double shell stator. These, together with sealed cast iron shields and conduit box, effectively protect it from external blows, dripping water, dusts and corrosive vapors and liquids. Long, sealed bearings also keep dirt from entering along the shaft.

New Pipe Tap Extractor

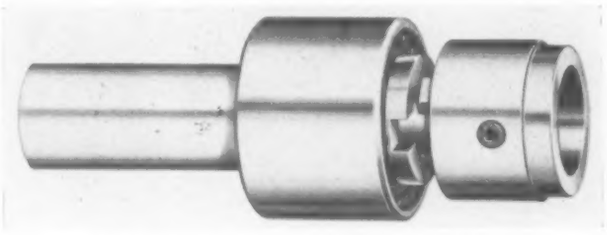
DESIGNED especially for quick and easy removal of broken pipe-threading-taps, a group of ten new **PIPE TAP EXTRACTORS** have been added as stock sizes by *The Walton Company*, 94 Allyn St., Hartford 3, Conn. These tools are designed on the same principle as the Walton extractors for hand and machine screw taps, which have been standard for several decades. The pipe tap extractors are immediately available for all sizes of pipe taps, from $\frac{1}{8}$" to 1" inclusive, for both regular and interrupted thread styles at list prices ranging from $1.70 to $4.50 each.



Releasing Tap Holder

Burg Tool Manufacturing Co., Dep't TE, 6709 South San Pedro St., Los Angeles 3, announces a new "Tool-Flex" **RELEASING TAP HOLDER,** that combines the features of self centering and full floating, the latter due to an oil resistant Neoprene insert.

The flexibility of "Tool-Flex" compensates for parallel and angular misalignment, eliminates binding—which causes tap breakage—and assures accurate tapping.

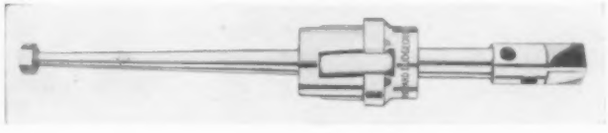


New Stroke Counter

A SMALL, RUGGED, completely encased non-reset **STROKE COUNTER,** with built-in protection against overtravel of the operating arm, is announced by *Production Instrument Co.*, 706-10 W. Jackson Blvd., Chicago 6. The operating arm, which may be installed on either side of the counter and set at any angle, works against a coil spring which permits the arm to continue beyond the full stroke without injury to the counter. The five large number wheels register to 99,999 and repeat.

Economy Tube Expanders

THE MODEL 16 Dudgeon **TUBE EXPANDER,** by *Richard Dudgeon, Inc.*, 24 Columbia St., New York 2, serves for all general boiler work and other jobs of tube expanding. Employing a minimum of parts, the tool can be readily dismantled and new rolls quickly inserted. The rolls are set at an angle for infeed, and reversing the mandrel releases the expander.

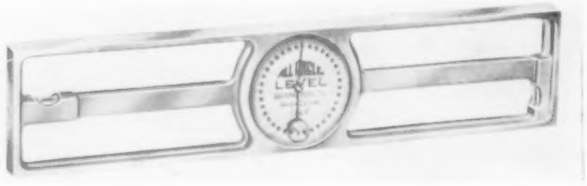


New Die Chaser Head

The Eastern Machine Screw Corporation, New Haven, Conn., announces a new Solid Adjustable Insert **CHASER DIE HEAD** for Goss & DeLeeuw Double Threading Chucking Machines. Known as Style SMM (size No. 103) the head takes the same carriers as the No. 103 size of opening die heads and has a normal thread range up to $1\frac{1}{4}$" diameter, 3" long. Outside diameter is $4\frac{3}{8}$". The shank fits over the spindle of the machine, thus permitting tapping while threading. The design results in a minimum amount of overhang, as the Die Head extends from the end of the spindle only about $3\frac{3}{8}$". It uses the H&G Insert Chasers that, over a period of years, have proven economical and simple to use.

All-Angle Level

A NEW spirit level which, as its name implies, is **ALL-ANGLE,** has been introduced by the *Brand Tool Co.*, 1513 E. Colorado Blv'd, Pasadena, Cal. Of heat treated aluminum and weighing less than a pound, the instrument may be used in any position. In addition to two air bubbles, one for horizontal use and one for plumb testing, the level incorporates, a dial indicator graduated to 360° and guaranteed accurate to within one-half degree.



New ½" Air Drill

A NEW **AIR POWERED DRILL,** of ½" capacity and designated as Model 7016, has been added to the line of air tools by *Aro Equipment Corp'n*, Bryan, Ohio. The new drill meets heavy duty, continuous production demands, yet is said to be 40% lighter then other drills of the same capacity.

One feature, of this tool, is an auxiliary handle, that can be instantly located in any position around the nose of the tool, and securely clamped. This feature saves time and adapts the tool to hard-to-get-at drilling jobs. Built to Aro standards of quality, the tool weighs but $6\frac{1}{4}$ lbs, with overall length $8\frac{5}{8}$". Speed is 1000 rpm.

North East West South in Industry

William J. Gamble (left) and son, **Robert N. Gamble**, have organized as **GAMBLE & GAMBLE**, Manufacturers Representatives, with offices at Buffalo, N. Y. The senior partner, who has served the A.S.T.E. several years as Director, is broadly experienced in metal fabrication and as a sales executive. The junior partner is a graduate mechanical engineer, Rensselaer Polytechnic Institute, and served in the Navy.

CHARLES E. KLAUS, representing the Portland, Ore., area for **Allen-Bradley Company** of Milwaukee, takes over the territory formerly served by Garland-Affolter Eng'g Corporation.

EMPIRE TOOL CO., Detroit, announces appointment of **F. Gordon Sporr** as Sec'y-Treasurer; and the naming of **David B. Grant** as Ass't Sales Manager.

ALEXANDER S. KELLER, Vice-President and Mg'r, Foreign Sales, of **Pratt & Whitney**, *Div'n Niles-Bement-Pond Co.*, is currently in Europe on what may be termed a good-will tour. Guest speaker at a luncheon of the Council of the Machine Tool Trades Ass'n (corresponding to the N.M.T.B.A.) held in London, July 25th, he opened his address by reading a cable greeting from **William P. Kirk**, a P & W associate, and President of the N.M.T.B.A.

In his remarks, Mr. Keller brought up problems of surplus, finances and export common to machine tool builders here and abroad. Mr. Keller will also visit Sweden, Finland, Holland, Belgium, France, Switzerland and Italy.

ALLEGHENY LUDLUM STEEL CORP'N, Pittsburgh, has licensed **Darwins, Ltd.**, British steel producer, to manufacture and distribute, in the British Empire excluding Canada, four grades of a once secret high temperature alloy, which is said to have been a vital link in the aircraft turbo-super-charger and jet propulsion programs of World War II.

SIZE CONTROL CO., a div'n of *American Machine & Gage Co.*, has moved into expanded quarters at 2500 W. Washington Blvd., Chicago. Its former location at 4718 W. Kinzie St., Chicago, will be taken over by **Walsh Press & Die Div'n** of the same parent company to augment facilities for that division.

C. M. RHOADES, JR. (left) has been named Engineer, *Machinery Div'n* **General Electric Company.** Mr. Rhoades, a graduate of Union College, Schenectady, in 1935, entered GE in the same year on a test course. J. D. Wright, Mg'r of General Electric's Industrial Engineering Divisions, also has announced appointment of **H. W. POOLE** (right) as Engineer, *Steel Mill Division*. Mr. Poole is a graduate of Kansas State College.

HOWARD F. MacMILLAN has been named Vice-President, **Bryant Machinery & Eng'g Co.**, Chicago, according to announcement by A. G. Bryant, President. Mr. MacMillan was for over 20 years with Hydraulic Press Mfg. Company and from 1938 through 1944, president and general manager.

THOMAS J. BANNAN, President and General Mg'r of Western Gear Wks, Seattle, Wash., is the newly elected President of **American Gear Mfgrs. Ass'n.** Mr. Bannan, a graduate of Santa Clara University, has been with Western Gear since 1917 when he began work as a machinist in the company's shops.

Quality Control Forum

THE FIRST OF TWO Conferences on Quality Control, sponsored to evoke authoritative discussion on this and kindred topics, was held the 13th to 16th of August at the Providence plant of **FEDERAL PRODUCTS CORPORATION.** A second conference is planned for September 10th to 13th.

During the August conference, the discussion largely centered on the economic advantage of quality control, statistical methods, gaging and inspection, with practical demonstrations under actual factory conditions. Included in the program were a practical description of statistical techniques and profitable applications of quality control.

Practical shop use of acceptance and sequential sampling, percent defective methods of scrap control, batch and chart control, visual 100% and patrol inspection will also be discussed. As a novel yet important diversion, a part of the program will be devoted to gage design, a subject heretofore largely confined to the experts. Gaging by various mechanical, indicating, electric, electronic and air instruments will also be demonstrated with practical application under shop conditions. Also included will be other aspects of quality control, including training costs and the justification angle, from the viewpoint of management.

The series of discussions are under leadership of qualified specialists, with collaboration by sales engineers from Pratt & Whitney Div'n, Niles-Bement-Pond Company, the Taft-Peirce Mfg Company, and representative quality control experts from U. S. Time, Inc., Sylvania Electric Products, The Norton Co., The Bristol Co., Remington Arms Co., Wanskuck Mills and New York University.

An Ideal Threading Combination

THE LANDMACO

for Large Precision Work

THE 3/8" HIGH SPEED

for Small Parts

The LANCO Head

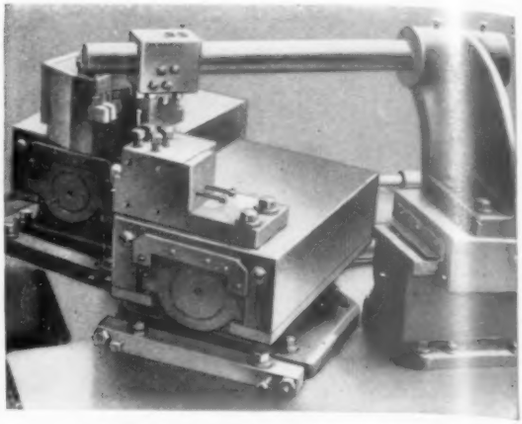
For manufacturers of screw machine products and other small threaded components, the efficiency of this combination is clearly demonstrated by the production records of the machines illustrated. Threading 5/8" diameter 24 pitch threads to class three specifications, the LANDMACO Machine produces 600 pieces per hour. On some smaller threaded parts made from brass the 3/8" High Speed Machine has produced as high as 60,000 pieces per grind of the chasers.

Write for Bulletin No. H-91

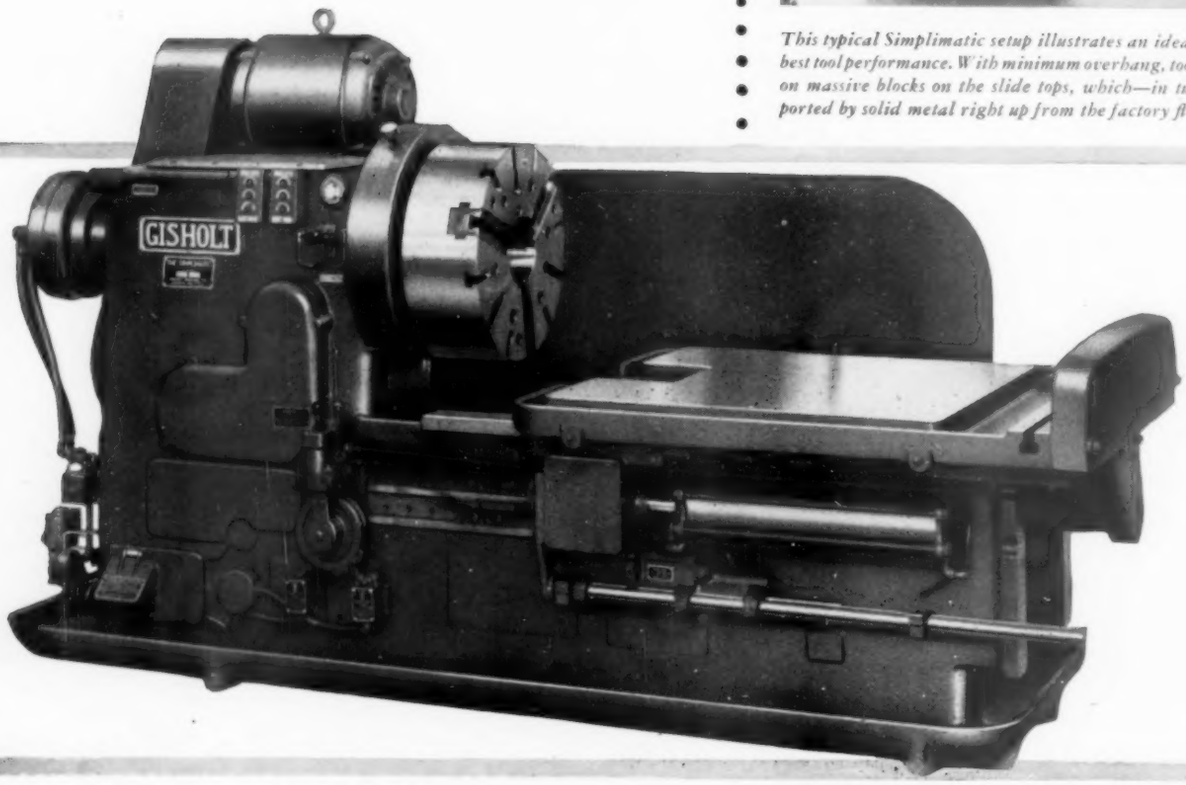
LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·

WHY tooling is more effective on the GISHOLT SIMPLIMATIC

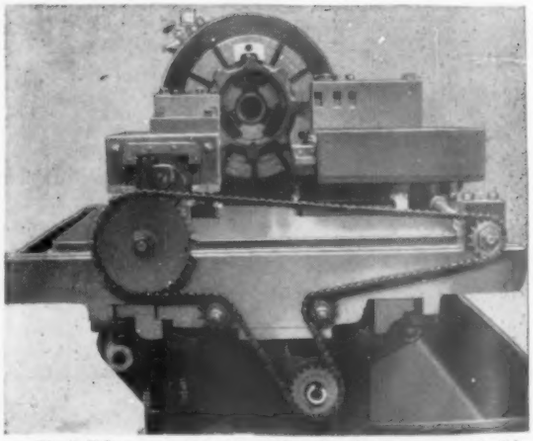


This typical Simplimatic setup illustrates an ideal condition for best tool performance. With minimum overhang, tools are mounted on massive blocks on the slide tops, which—in turn— are supported by solid metal right up from the factory floor.



You can always place tools to best advantage on the large horizontal platen table of the Simplimatic. You can individualize the machine with a slide arrangement most suitable for the specific job, and have an ideal condition for each tool as to overhang, order of engagement, feed, dwell and retract.

Moreover, you have utmost rigidity for tool support. With slides as well as the heavy platen table resting on and against hardened and ground steel ways and gibs, there's no vibration or chatter. High-speed production, within close limits of accuracy, makes the Simplimatic the wise selection for large volume machining. Write for literature.



Tool slides are independent of each other because each slide is individually cammed. Slide top engages cam directly, eliminating all bars, beams, pivots or levers between the driving cam and the cutting tool. Pick-off gears and sprockets provide wide choice of feeds.

GISHOLT MACHINE COMPANY

1257 East Washington Avenue • Madison 3, Wisconsin

GISHOLT

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements
In Metal Turning

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

What jobs have you for CARMET to do?
In addition to a most complete line of Carmet cutting tools and blanks, we are equipped to make pre-formed pieces of sintered carbides to practically *any* specification for type, size, shape or tolerance—furnished plain or finish-ground. • Solve that "problem-part" of yours—*call for an Allegheny Ludlum Tool Engineer.*
Here's an Example! Plunger, Bearing and Cutting Die, made of CARMET Carbide
AL
Allegheny Ludlum Steel Corporation
CARBIDE ALLOYS DIVISION, Ferndale (Detroit) Michigan

It Costs Money to Guess Wrong

During years of making and selling tool steels, we've been struck again and again by this odd quirk in human behavior.

When a man is sick he sees his doctor. When a legal problem confronts him, he puts it up to his lawyer. When he plans a home, he consults an architect. Yet, strange as it sounds, he is apt to waste a great deal of money picking and using the wrong tool steels, when he could have the sound advice of an expert—without its costing him one cent!

The selection of the proper tool steels isn't easy. Though greatly simplified today, it still has many complexities. Using the wrong steels can be costly—and isn't necessary. If you're not sure which steel to use for a given application, we strongly suggest that you call Bethlehem.

It will cost you only a few minutes to talk with Bethlehem metallurgists and tool specialists. It may save you a lot of money. So, if uncertain, don't try to be your own doctor for tool-steel troubles.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

★ BETHLEHEM STEEL ★

Bethlehem tool steels for every purpose

AIR DRILLS by ARO

DELIVER MORE POWER... WITH LESS WEIGHT

A Complete Range of Air Drills for all types of continuous production work... up to ½" capacity.

A Model 101, plastic housing, ¼" drill. 2500 R.P.M. Weight 1 lb. 9 oz.

B Model 109, aluminum housing, ¼" drill. 2500 R.P.M. Weight 2 lbs.

C Model 7027, pistol grip aircraft drill. 7000—17,000 R.P.M. Speed adjustable.

D Model 7028, button throttle aircraft drill. 7000—17,000 R.P.M. Speed adjustable.

E Model 22PDX, pistol grip throttle, ¼" and 5/16" drill. Weight 2 lbs. 9 oz.

F Model 22PDZ, pistol grip throttle, ⅜" drill. 2500 R.P.M. Weight 3 lbs.

G Model 7012, ¼" drill with No. 2 Morse Taper Head.

H Model 22BRY, right angle ¼" drill.

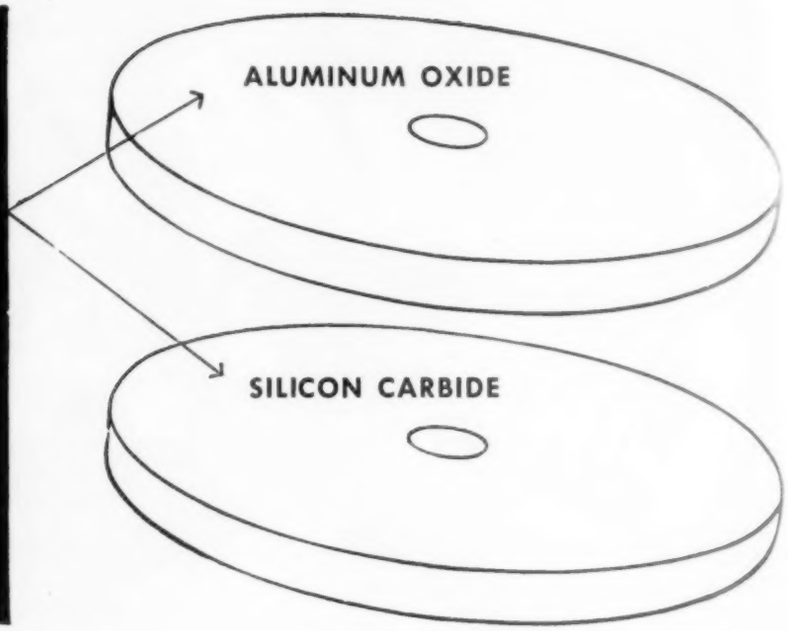
I Model 135, ⅜" drill. Weight 5¾ lbs.

J Model 7016, up to ½" capacity drill. Has variable position auxiliary handle. Weight 6¼ lbs.

Do your drilling faster and better with ARO Pneumatic Tools... also specify ARO for screw-driving, nut-setting, grinding, polishing, sanding, filing and other production jobs. Precision-built ... dependable. Write for literature. The Aro Equipment Corporation, Bryan, Ohio.

NEED TOOLS *NOW*?
SEE YOUR ARO JOBBER!

Which Abrasive is right for the Job?



WHEN adequate consideration is given grinding cost figures accounted for in wheel life, man hours, power consumption, volume and quality—selecting the best abrasive to use assumes new importance.

Aluminum Oxide and Silicon Carbide are the two most widely used abrasives. In many respects, characteristics of each differ widely. The degree of variation is further extended in the many modifications of each type.

To choose one of these types of abrasives only on the basis of the material to be ground is not enough. Other variables affect the selection. Among these are contact area of wheel and work, amount of stock to be removed, and type and condition of the grinder.

To render practical aid in correctly evaluating these and other factors, as well as to serve as a double check on your choice, The Carborundum Company has organized a system which many successful concerns depend on for improved grinding, at lower cost.

A CARBORUNDUM salesman or our distributor's representative is your first contact with this system. These men personally can offer worthwhile suggestions based on a knowledge of current abrasive developments, plus plenty of on-the-job experience.

When the problem calls for an unusual solution, one of our Abrasive Engineers is called in. A trained specialist, he is supported by the findings of the world's best known abrasive laboratories.

Because you are interested in better grinding at lower cost, it makes sense to take advantage of this practical, easy-to-use service. Whenever you have an abrasive question, feel free to call in CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

A good rule for good grinding... **CALL IN**

CARBORUNDUM

TRADE | MARK

BONDED ABRASIVES

WHEELS
Silicon Carbide
Aluminum Oxide
Diamond

Cylinder Hones
Sticks, Stones & Rubs
Specialties

COATED ABRASIVES

Paper, Cloth and Combination

Sheets, Rolls, Discs

ABRASIVE GRAINS AND COMPOUNDS

for:

Polishing
Lapping
Pressure Blasting
Finishing

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

NEW BRYANT SQUARENESS OF FACE GAGE

Invaluable for quality control of threaded parts

The *new* Bryant Squareness of Face Gage is an invaluable postwar aid to quality control of threaded parts that must fit precisely and squarely. It is mounted on any standard Bryant Thread Gage and offers a faster, easier and extremely accurate means for checking threads and the important relationship between the pitch diameter of the thread and the face of the part.

Operation of the *new* Face Gage is simple. The inspector drops the part onto the Thread Gage — a third of a turn inspects the threads all over — then the Squareness Gage is swung into position and a half turn more checks the right angularity. No "feel" is necessary, no special fixtures are required, and *accuracy appears visually* on the large dial indicators.

The *new* Squareness of Face Gage consists of a movable arm (see phantom photo) which carries a large dial indicator and two contact points, which are adjustable to cover the capacity of the thread gage. The inner contact serves as a pilot and compensates for thread progression as the part is turned for inspection. The contact on the dial indicator *visually records squareness.* The part is located on the pitch line by the uniquely designed segments of the Thread Gage.

Do you want to reduce inspection time, through *visual multiple dimension checking* at one station by one operator? Then write for details on the *new* Bryant Squareness of Face Gage.

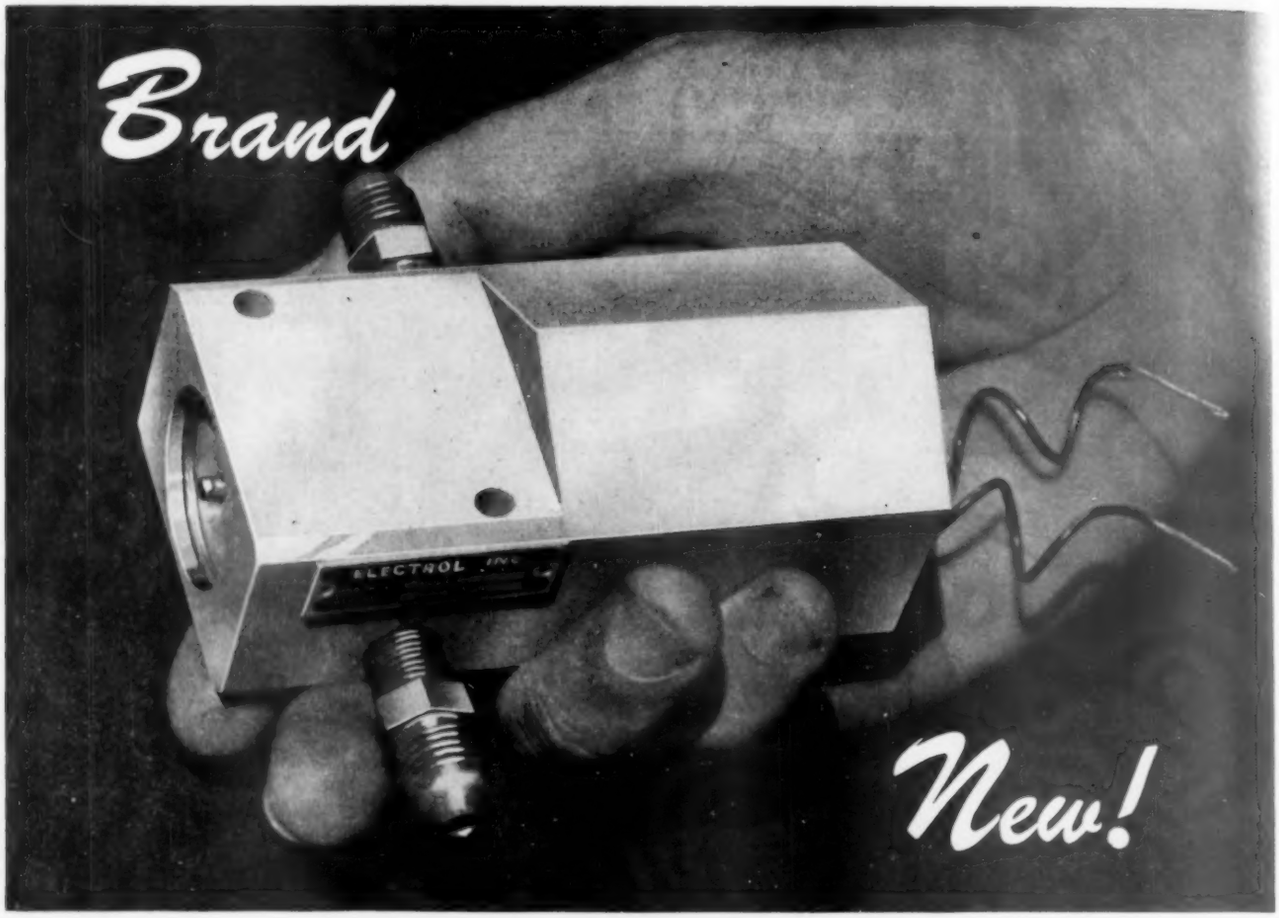
ALSO BENCH MODEL THREAD GAGES, UNIVERSAL DIAMETER GAGES, ADJUSTABLE THREAD GAGES AND PORTABLE THREAD GAGES.

another Bryant postwar development

BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.



ELECTROL'S Solenoid 2-way Valve

Cylinders
Selector Valves
Follow-up Valves
Check Valves
Relief Valves
Hand Pumps
Powerpaks
Oleo Struts
Solenoid Valves
On-Off Valves
Unloader Valves
Servo Cylinder
and
Transfer Valves

. . . provides remote control of hydraulic valve *without* the conventional tubing and oil lines and makes it *ideal* for use in crowded and hard-to-get-at places . . . It is lighter (weighs only 1¼ pounds) . . . Smaller (measures only $3^{9}/_{16}$" x 1¾" hexagon) . . . Operates on 12-24 volt direct current . . . Accommodates flow up to 2 gallons per minute with pressure range *from a fraction of a pound per square inch* up to 1500 P.S.I. Complete information on this new, effective, efficient, economical SOLENOID 2-WAY VALVE will be mailed upon request.

ELECTROL

INCORPORATED

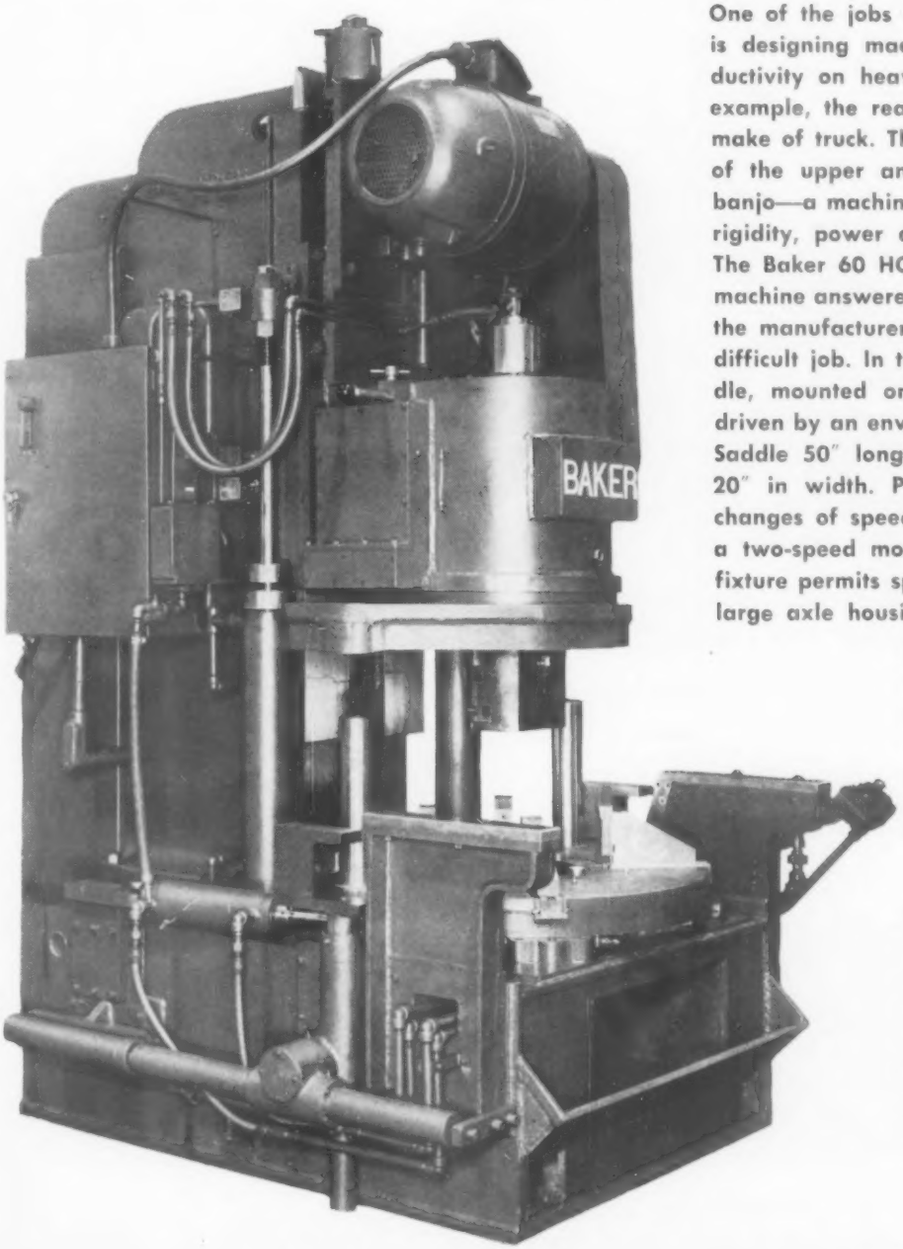
FOR BETTER HYDRAULIC DEVICES

KINGSTON, NEW YORK

AUTOMOTIVE PLANT REPORTS

Increased Productivity

BORING REAR AXLE HOUSINGS ON THE NEW BAKER 60 HO-4 EXTRA HEAVY DUTY MACHINE



One of the jobs which Baker Brothers do best is designing machines to give increased productivity on heavy duty operations. Take, for example, the rear axle housing for a popular make of truck. The job called for rough boring of the upper and lower bores in the center banjo—a machine was needed which combined rigidity, power and high productive capacity. The Baker 60 HO-4 vertical boring and facing machine answered these demands, and enabled the manufacturer to get increased output on a difficult job. In this machine the oversize spindle, mounted on preloaded ball bearings, is driven by an enveloping worm and worm gear. Saddle 50" long is mounted on ground ways 20" in width. Pick-off gears give two quick changes of speed, or four spindle speeds with a two-speed motor. A special quick-operating fixture permits speedy, accurate locating of the large axle housings being bored.

For extra heavy drilling, large diameter boring or sweep facing, get our recommendations for tooling up the 60 HO-4 for increased productivity.

●

Baker machines are designed, not to eliminate the human element, but rather to relieve the operator of as much physical effort as possible, so that he can do a faster, more efficient job with greater ease and less fatigue.

★ SINGLE AND MULTIPLE BORING MACHINES FOR DRILLING, BORING, FACING, TAPPING ★

Baker Bros., Inc. TOLEDO 10, OHIO

TWO JOBS IN ONE!

with GRAND RAPIDS combination tap and drill grinders

AT LESS COST
IN LESS TIME
IN LESS SPACE

Gallmeyer & Livingston's GRAND RAPIDS Combination Tap and Drill Grinder is the only machine of its type. All of the advantages of the Grand Rapids Twist Drill Grinder and the Grand Rapids Tap Grinder are combined in this one machine.

You save three ways by investing in this machine: On first cost, on lower maintenance expense and on valuable floor space.

Write for Bulletin G.L. 9-15-44

SPECIFICATIONS

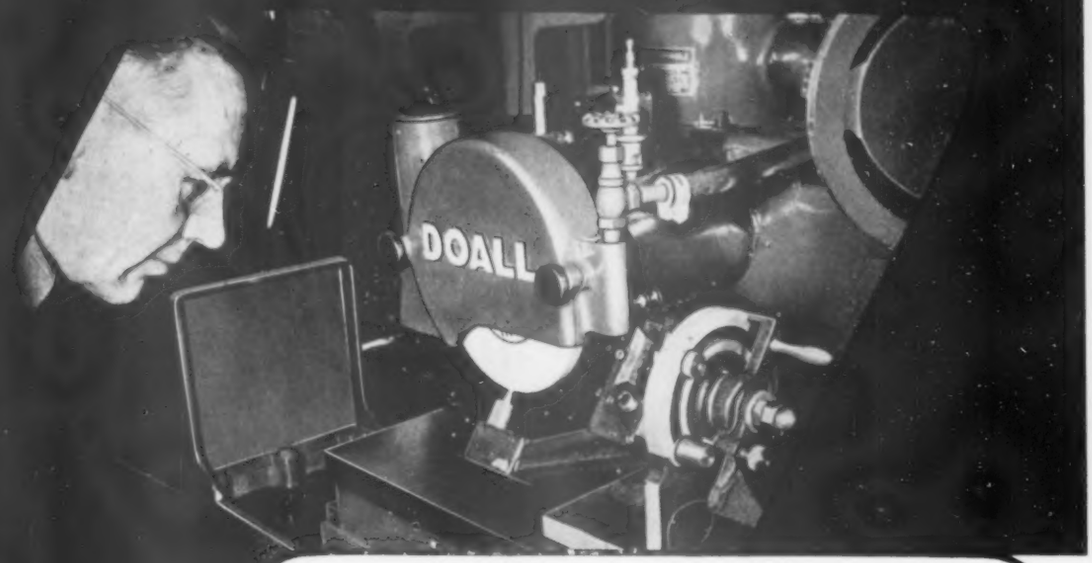
Capacity (drill)	⅛" to 1½"
Capacity (tap)	No. 6 to 1½"
Spindle Speed	1725 R.P.M.
Dia. Grind. Wheels	10½" and 12"
Motor	1 H.P.

GRAND RAPIDS
MANUFACTURED BY
GALLMEYER & LIVINGSTON CO.
GRAND RAPIDS, MICHIGAN, U.S.A.

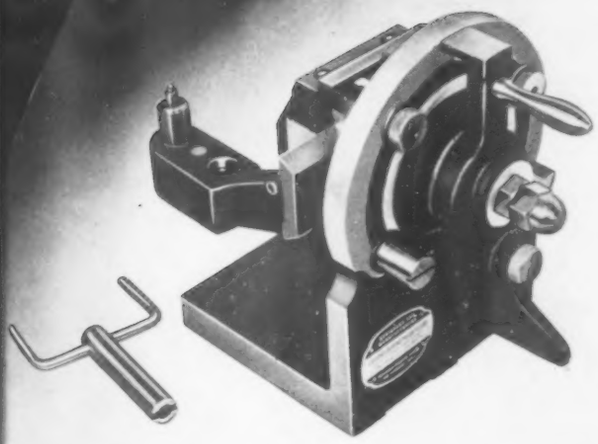
What "GRAND RAPIDS" Quality Means: Gallmeyer & Livingston cast their close-grained gray iron, machine to micrometric tolerances, precision-assemble grinding machinery of unsurpassed performance. *Grand Rapids* means *top* quality in grinding machinery.

GALLMEYER & LIVINGSTON CO., 110 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

LIFETIME PRECISION!



Typical grinding wheel shapes produced by continuous travel of dresser without any change in the setup



Unsurpassed Precision: Dresses wheels to intricate shapes within tolerances of .0005"—angles, radii and their combinations—perfect blending of radii and tangents. Unit completely adjustable to "no play." Wheels dressed in their working position to eliminate error.

Adjustable for Life: To compensate for wear, all functional parts are completely adjustable assuring lifetime precision. Has sectional taper bearing, lock-gib adjustment of carriage, taper-lever carriage centerlock, screw feed for angular cuts, ball-bearing end thrust.

Large Capacity: Dresses wheels up to 14" diameter (to 24" with special extension), 3" male and female radii. Range of 200° for angular work; permits dressing of clearance angles of 10° on either side of wheel beyond full 180° scope. Travel of 2" for angular surfaces and 1" travel on either side of dressed radii.

Fast, Easy Setups: Even the most complicated setups are made right on the bench—all parts visible and readily accessible—a great time-saver in any shop.

General Use: For all machines where a flat surface, square to any radial line of the wheel, can be provided.

Complete at Low Price: Comes in special hardwood case with 9 diamond tools, 7 tool holders, setting gage and wrenches. Priced so any shop can have one. Greatest value in a precision dresser that never wears out. Circular shows advanced engineering features—Write for one.

DoALL

GEROTOR

HYDRAULIC PUMPS & VALVES

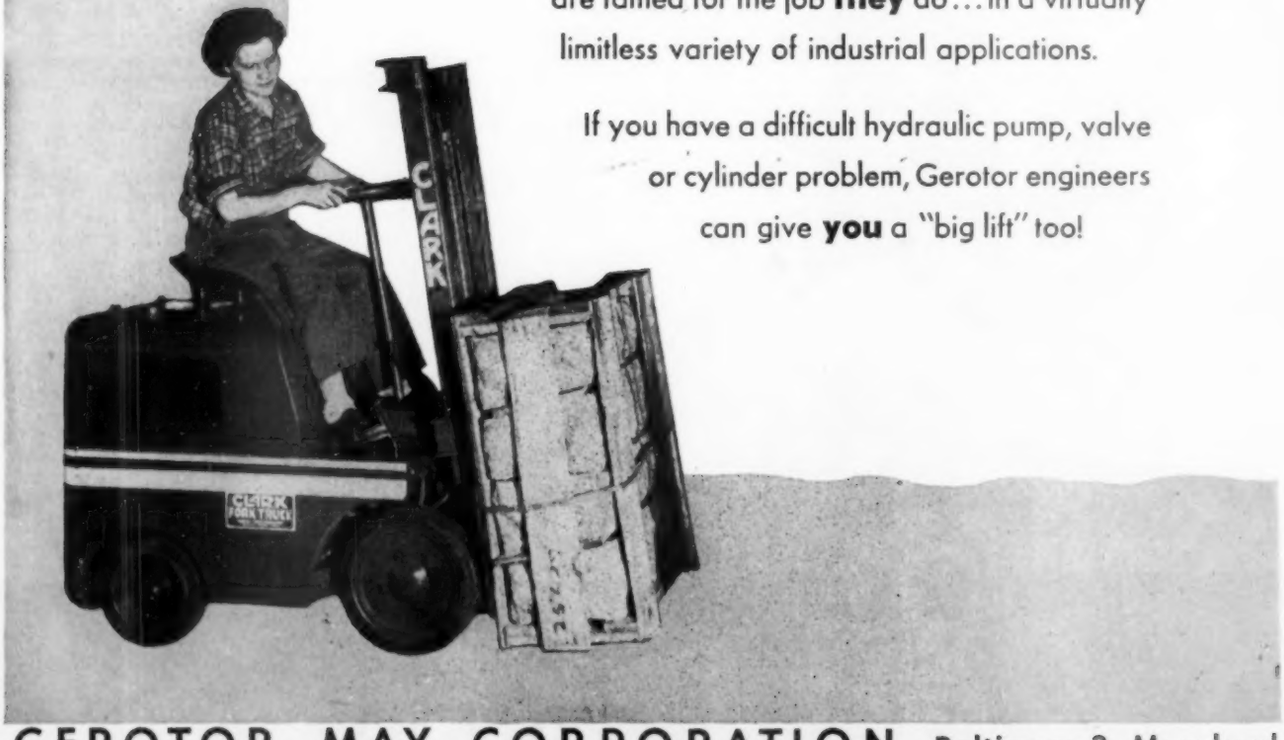
GIVE A big lift TO INDUSTRY IN

CLARK Materials-Handling Trucks

At the heart of the power plant in the Clark industrial Trucloader... famed for heavy-duty lifting and tiering ...you'll find a Gerotor hydraulic pump and a Gerotor hydraulic valve at work.

These Gerotor units, and many others like them, are famed for the job **they** do... in a virtually limitless variety of industrial applications.

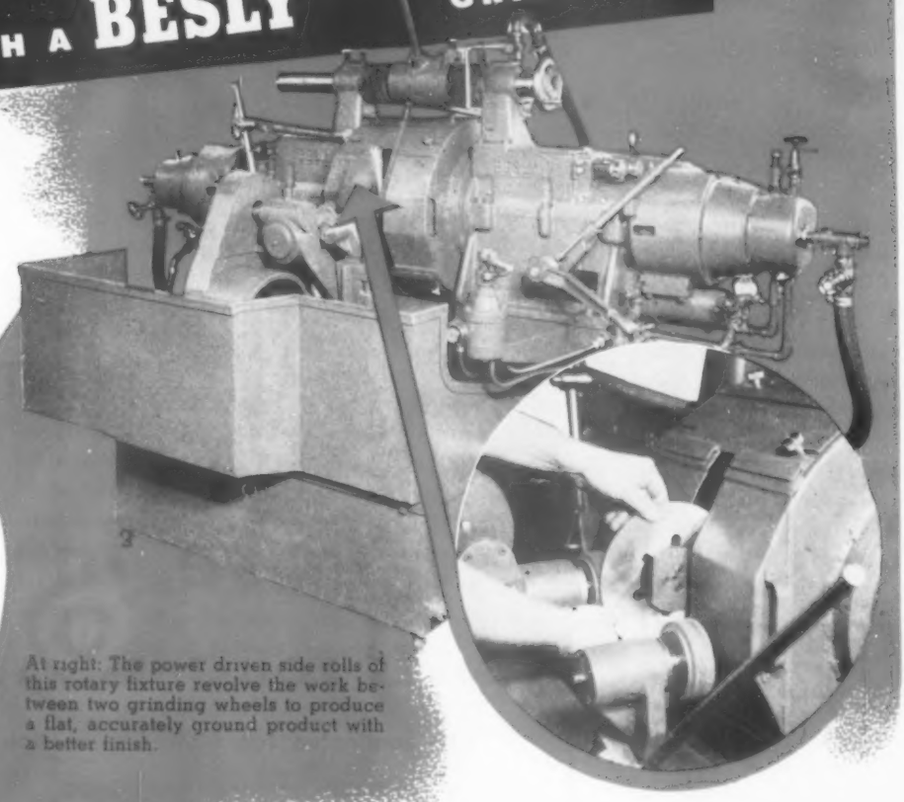
If you have a difficult hydraulic pump, valve or cylinder problem, Gerotor engineers can give **you** a "big lift" too!



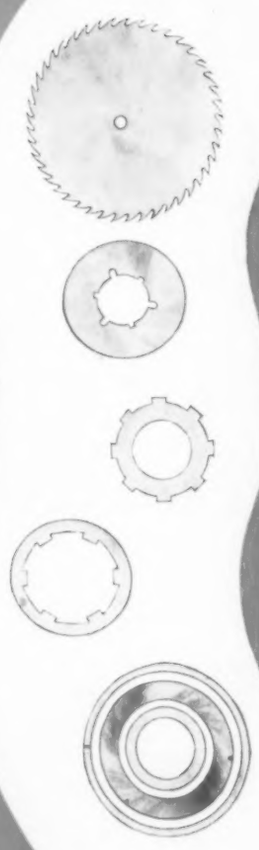
GEROTOR MAY CORPORATION Baltimore 3, Maryland

NOW YOU CAN GRIND LARGER AREAS FLATTER ....

...WITH A BESLY GRINDER



At right: The power driven side rolls of this rotary fixture revolve the work between two grinding wheels to produce a flat, accurately ground product with a better finish.



These are a few of the many pieces that can be ground flatter, with a No. 218-20" Besly Grinder.

Circular saws, clutch discs, etc., up to 16" in diameter can now be accurately ground on both sides *at the same time*, with less warping or bowing. The 218-20" Besly double spindle grinder employs a power operated side driving roll that revolved the work between the two grinding wheels.

The result is fewer rejects, with production running from 25 to 100 pieces per hour depending on the areas ground and amount of stock removed. Oil is used as a coolant.

The same machine, with a hand operated swinging fixture, is used when grinding smaller pieces.

This new-type fixture on a Besly grinder may answer one of your tough grinding problems. Ask a Besly engineer to suggest improved methods of flat surfacing at a reduction in costs. Write us today.

BESLY

BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
BESLY GRINDERS AND ACCESSORIES

CHARLES H. BESLY AND COMPANY, 118-124 N. Clinton St., Chicago 6, Ill. • Factory: Beloit, Wis.

NEW TOP PLATE
Speeds Small Parts Production

New all steel hardened laminated to plate adds hundreds of production hour to life of work surface of electro-mag netic chuck.

Available on HANCHETT ELECTROMAGNETIC CHUCKS

at No Increase In Price!

CHUCKS
With Laminated
TOP PLATE
NOW READY
IN THESE SIZES

6" x 18"
6" x 24"
8" x 14"
8" x 25"
8" x 36"
8" x 48"

Other Sizes Available Soon!

GIVES YOU THESE ADVANTAGES

* Fine Laminated Top Plate Construction
* 22% greater magnetic work area
* More uniform distribution of holding power
* Holds even smallest work pieces firmly
* More work pieces finished per load
* Less possibility of work slippage
* Longer service life when top plate is furnished hardened (at slight extra cost)

See your nearest Hanchett dealer or write for Bulletin 045-ITI for detailed information.

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

HANCHETT HERMETI-COIL MAGNETIC CHUCKS

Precision cylinder construction

6 x 10 inch cylinder with head end cushion

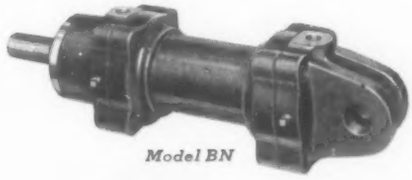
Builders of machine tools, steel mill equipment, heavy duty lift trucks, and many other types of hydraulic actuated equipment find Hannifin precision hydraulic cylinders deliver performance that matches the finest of modern machine design. Hannifin cylinder construction means a simpler and easier installation, efficient use of hydraulic power, and long life without maintenance.

No-tie-rod design provides a strong, simple cylinder, and allows removal of an end cap without collapse of other parts. Either end cap can be positioned independently for simplest piping and mounting.

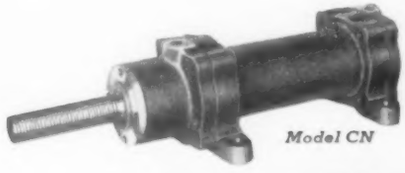
Cylinder bodies are bored and honed to exact size, giving a cylinder interior that is straight, round, perfectly smooth. The use of a piston with precision rings in this accurate cylinder bore provides high efficiency piston seal, maintained throughout a long service life. Exact bores and close tolerance piston with precision rings means minimum fluid slip and maximum useful hydraulic power.

Seven standard mounting types are available in a full range of sizes, 1 to 6 inch bore, with any length stroke. Cylinders can be furnished with or without adjustable cushion, and with small diameter piston rod, 2 to 1 differential piston rod, or double end rod. Many special mountings and large size cylinders are also available built to order. Write for Bulletin 35.

Hannifin Manufacturing Company, 621-631 South Kolmar Avenue, Chicago 24, Illinois.

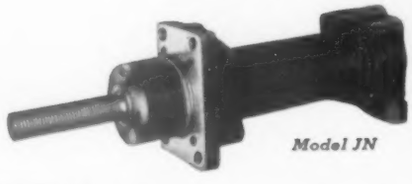


Model BN



Model CN

Model EN



Model JN

Many other mountings available

HANNIFIN

HANNIFIN · CHICAGO · USA

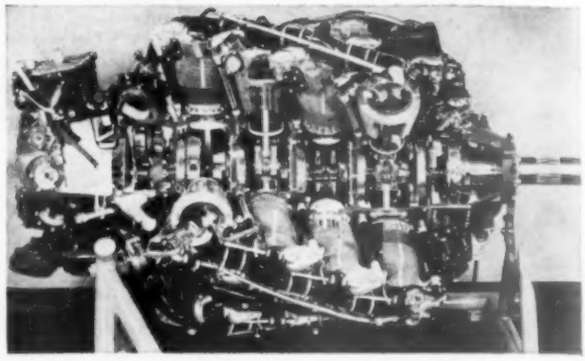
TRIPLE EXAMPLES of improved performance with TRIPLE ALLOY STEELS...

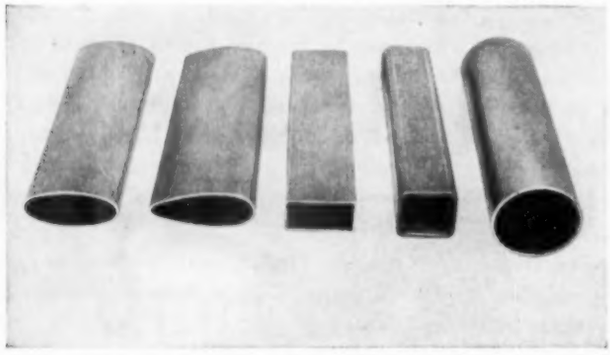
NICKEL, CHROMIUM, MOLYBDENUM

(A) CARBURIZING GRADES

Helps Aero Engine Deliver World-Record Power

Utilizing Nickel-chromium-molybdenum triple-alloy steels wherever alloy steels are needed . . . this 3405 pound Pratt & Whitney "Wasp Major" aircraft engine delivers over 3650 horsepower. Among the highly stressed parts of triple-alloy steels are gears, piston pins and knuckle pins of 9315 and 4320 type steels. Excellent carburizing properties help make these types especially good for case-hardened parts subject to heavy duty service.





(B) MEDIUM CARBON GRADE

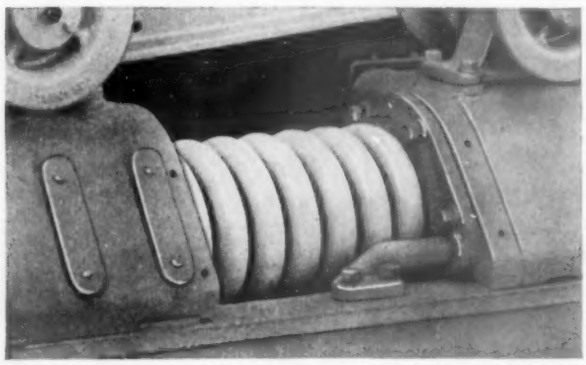
Promotes Reliability in Aircraft Tubing

Triple-alloy steel of the 8630 type is ideal for air frames and other aircraft tubing applications where a high strength/weight ratio is vital. Excellent welding and forming characteristics help assure improved response to fabricating operations. The photograph shows a few of many shapes available from Summerill Tubing Company.

(C) HIGH CARBON GRADE

Doubles Impact Resistance in Tractor Springs

Adoption of "8655" triple-alloy steel for tractor coil springs varying from ¾" to 1¾" in diameter, enabled Caterpillar Tractor Co. to raise impact requirements from a minimum of 10 foot pounds (Charpy double width bar) to 20 foot pounds. Exceeding this higher figure without difficulty, this triple-alloy steel provides not only high elastic strength but improved resistance to shock and fatigue failures.



These triple-alloy steels (Nickel-chromium-molybdenum) have established notable records in numerous diversified and exacting industrial applications. The large number of compositions available permits choice of the right triple-alloy steel for a specific use.

We invite inquiries regarding the selection and uses of triple-alloy steels containing NICKEL.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.

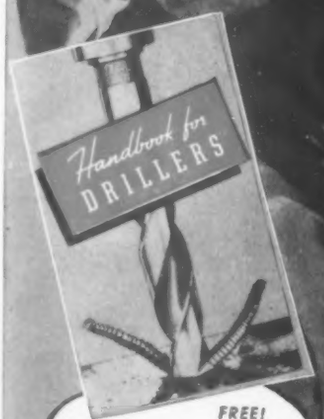
When they ask for

PEERLESS ~~HIGH~~ SPEED REAMERS

TRADE MARK REG. U.S. PAT. OFF.

...THEY GET MAXIMUM TOUGHNESS AT MINIMUM COST

Good tools help any machinist do a better job . . . at lower cost. This explains why there is such a steady demand for PEERLESS High Speed Reamers and the many other CLEVELAND Tools of equally high quality—Twist Drills, Screw Extractors, Arbors, Mandrels, Sockets, Mills, Counterbores, and MO-MAX High Speed Ground Tool Bits and Cut-off Blades.



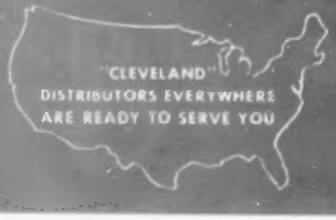
FREE! Write to Dept. X for your copy of the valuable booklet shown above.

Telephone YOUR I INDUSTRIAL S SUPPLY D DISTRIBUTOR

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND 14

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

70 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 650 HOWARD ST., SAN FRANCISCO 5
2020 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
E. P. BARRUS, LTD., LONDON W. 3, ENGLAND



Tools That Have Helped to Make Automotive History

PRECISION MACHINES pm PARKER · MAJESTIC

Since 1907, the name of Parker has been a part of the progress of the automobile industry.

In 1915, Parker introduced the basic principle of ball bearings in grinding manufacture—a major advance in grinding which was unknown at that time.

A few years later the Parker Ball Bearing was patented to meet high speed and precision requirements and has been in use ever since.

Further research and engineering development brought forth the well-known Parker Majestic External and Internal Grinding Machines, each machine representing a great advance in simplicity of operation and precision.

The latest tooling development of the company is the Parker Majestic No. 2 Surface Grinder that provides new accuracy and flexibility for small grinding operations.

These many products of Parker Majestic will continue to serve the great automotive industry in the future, keeping pace with its demands for speed, accuracy and dependability.

MANUFACTURED BY

MAJESTIC TOOL AND MANUFACTURING COMPANY

147 JOS CAMPAU • DETROIT 7, MICHIGAN

Talide
(TUNGSTEN CARBIDE)
Performance!

TALIDE METAL MEETS EVERY REQUIREMENT

"98% More Production per Tool Grind with Talide Tools"

The chief engineer of a prominent manufacturer recently compared performance on different carbide cutting tools on a non-ferrous aircraft part. He reports . . .

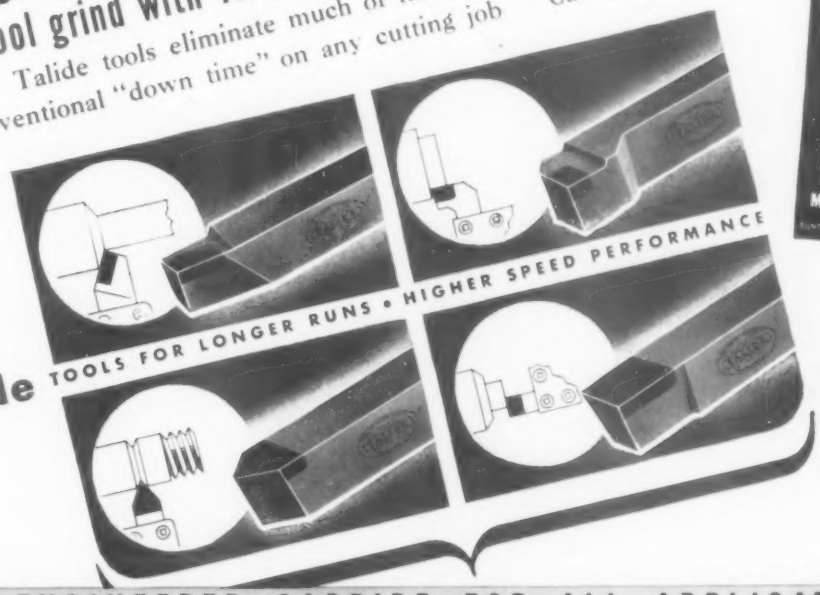
"98% More production per tool grind with TALIDE"

Talide tools eliminate much of the conventional "down time" on any cutting job —turning, boring, or facing. They keep cutting on and on and on.

Universally used for cutting operations on steel, cast iron and non-ferrous metals and non-metallic materials, Talide Tools are guaranteed to slice production costs.

You can obtain Talide tool tips direct from stock or a Talide sales engineer will call and recommend the proper use and grade of Talide Carbides for you.

Send for Catalog 44-T listing standard Talide Tools and Tips.



ARMY E NAVY

THE ENGINEERED CARBIDE FOR ALL APPLICATIONS

MC TALIDE

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

SINTERED CARBIDES FOR CUTTING • HOT PRESSED CARBIDES FOR DRAWING AND WEAR RESISTANCE

MIDVALOY STAINLESS BARS

The rapidly expanding market for stainless steel products has called for the production of many types of stainless steel bars.

Midvale's long years of experience in manufacturing fine bar steels has proved to be of inestimable value, particularly when meeting requirements for special types about which little was previously known.

Midvaloy stainless steel bars regularly produced include all the usual types in the three principal groups—Chromium Nickel, Non-Hardenable Straight Chromium and Hardenable Straight Chromium—as well as many special types for special purposes.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

OFFICES: NEW YORK • CHICAGO • PITTSBURGH
WASHINGTON • CLEVELAND • SAN FRANCISCO

STAINLESS AND TOOL STEEL BARS

•

CORROSION AND HEAT RESISTING CASTINGS

•

FORGINGS AND RINGS

MIDVALE

Custom Steel Makers to Industry

Ultimate

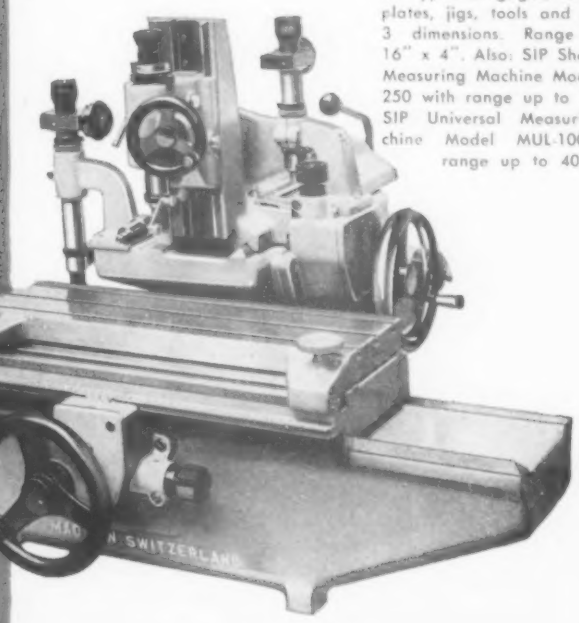
IN PRECISION INSPECTION!

The art of building equipment for taking accurate measurements has been brought to its highest development in SIP Measuring Apparatus and Profile Projectors. Their refinements are the result of more than 80 years of experience in the field of high precision metrology.

A wide range of useful applications makes the SIP Universal Measuring Apparatus No. MU-214-B a practical measuring standard for any shop, an instrument to which all measurements in 3 dimensions, even of master gages, can be referred.

The SIP Profile Projector features Type AP-10 four different magnifications with objectives and condensers rigidly mounted in 2 turrets. Magnifications of 10X, 20X, 50X and 100X, or any other of 4 combinations, can be quickly obtained simply by rotating the turrets.

A SIP-equipped inspection department combines versatility and authoritative precision. Consult our engineers for help in selecting the most practical equipment for your needs.



SIP UNIVERSAL MEASURING APPARATUS

Model MU-214-B. For checking all types of gages, rules, templates, jigs, tools and parts in 3 dimensions. Range up to 16" x 4". Also: SIP Shop Gage Measuring Machine Model MUL-250 with range up to 10" and SIP Universal Measuring Machine Model MUL-1000 with range up to 40".

SIP PROFILE PROJECTOR AP-10

Close-up shows four-stop turrets containing objectives and condensers providing quick-change-over from one magnification to another. Object table, 5½" x 8⅜". Also types AP-11 with object table 6½" x 8½" and AP-6 with work capacity 7⅛"x8".

We also represent in the United States other world-famous Swiss High Precision Equipment: Andre Bechler —Maag Gear Wheel Co.—Mikron—Safag—Studer—Sallaz—Schaublin—Lienhard—Billeter—etc.

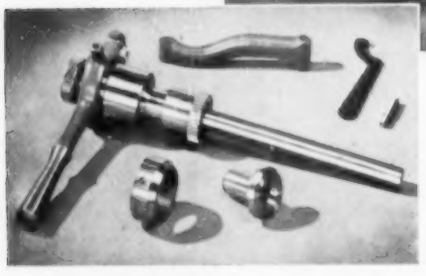
HIGH PRECISION MACHINE TOOLS AND MEASURING INSTRUMENTS

COSA CORPORATION

CHRYSLER BUILDING
New York 17, New York

ENGINEERED FOR ACCURACY

14-1/2" x 8' South Bend Quick Change Gear Lathe. Made with 5', 6', 7', and 8' bed lengths. Available also in Toolroom models.



BROADEN THE SCOPE OF YOUR LATHES

South Bend Attachments and Accessories simplify and speed tooling, often save delay and expense of making special fixtures. Shown above is the Handlever Draw-in Collet Attachment. Write for illustrated Catalog No. 77 which shows all South Bend Attachments and Accessories.

South Bend Lathes are engineered to meet exacting needs for precision accuracy in all types of industries, and to maintain their accuracy year after year, even under strenuous production conditions. Accuracy and long life are built into South Bend Lathes as carefully and surely as they are built into fine timepieces. Correct design based on nearly forty years of research and experience, quality materials specially selected for specific needs, expert craftsmanship, strict inspection through all phases of production and assembly, and thorough testing to rigid working tolerances before shipment, guarantee dependable performance in laboratory, toolroom, production shop, and maintenance department.

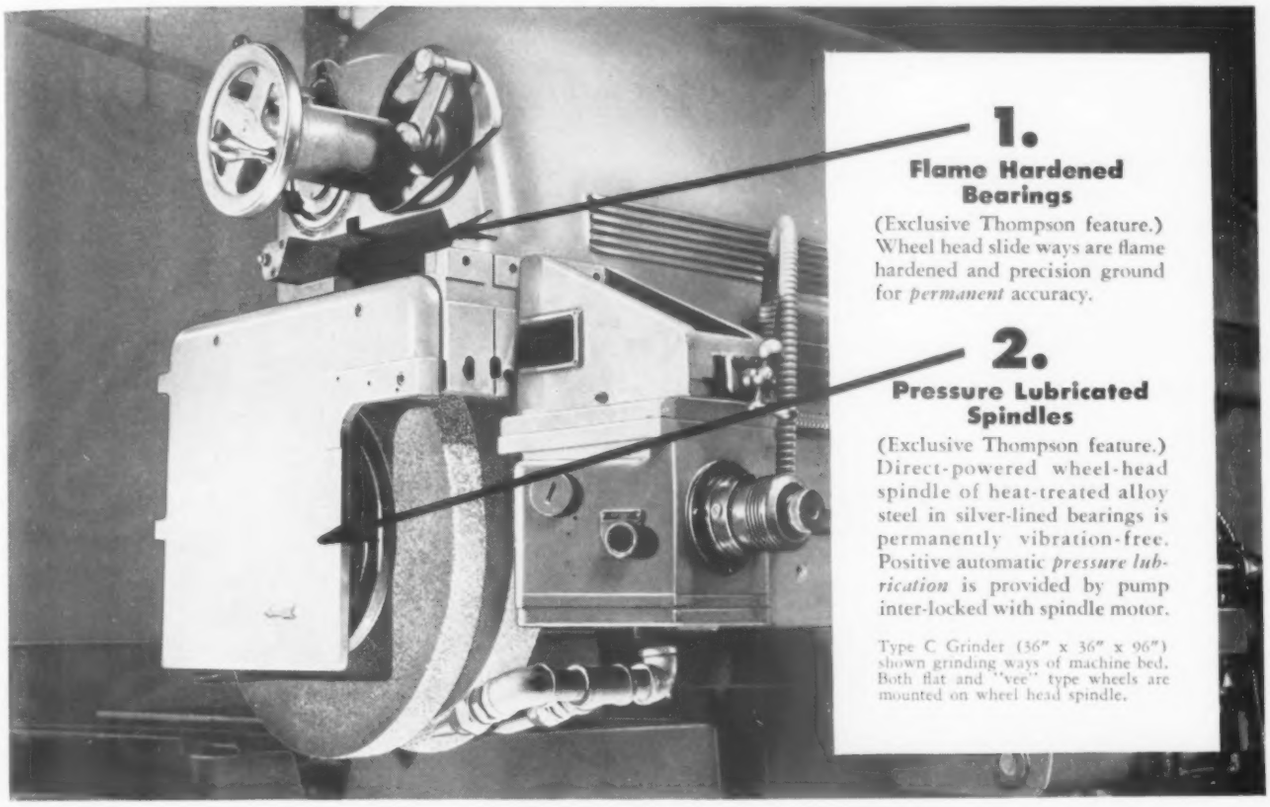
South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings, and bed lengths to 12'. Turret Lathes are made with collet capacities to 1". Write today for free 68-page catalog which illustrates all sizes and models, gives detailed specifications, and shows all attachments and accessories. Ask for Catalog 100-D.

SOUTH BEND LATHE WORKS

531 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906

Only Thompson provides all these cost-saving developments!



1.
Flame Hardened Bearings

(Exclusive Thompson feature.) Wheel head slide ways are flame hardened and precision ground for *permanent* accuracy.

2.
Pressure Lubricated Spindles

(Exclusive Thompson feature.) Direct-powered wheel-head spindle of heat-treated alloy steel in silver-lined bearings is permanently vibration-free. Positive automatic *pressure lubrication* is provided by pump inter-locked with spindle motor.

Type C Grinder (36" x 36" x 96") shown grinding ways of machine bed. Both flat and "vee" type wheels are mounted on wheel head spindle.

3. Automatic Wheel Truing (pioneered by Thompson). The stationary truer provides instant availability of the truing tool. All wheel head slides are now equipped with hydraulic wheel truing feeds. It is not necessary to disturb the work piece in order to true the wheel.

4. Angular Wheel Truing (pioneered by Thompson). Attachment equipped with two truing tools, both sides of the included angle are trued simultaneously. Universal motor with speed variation 5" to 40" p.m. controlled by governor insures accurate, smooth truing for fine finish and precision on work piece.

5. Automatic Down Feed (exclusive Thompson feature). Feed cycle of .00025" to .004" is available at each table reversal for plunge cutting or at each wheel head feed reversal. Feed mechanism has automatic trip—can be pre-set for size control from elevating hand wheel graduations, duplicating accuracy to .0002".

6. Automatic Sparkout Control (exclusive Thompson feature). Allows table and wheel head to continue finishing cuts after automatic down feed device has reached pre-determined size. At fixed time after work size is reached, table rapid traverses to loading position and stops automatically. Usually furnished in conjunction with automatic down feed. This device maintains accurate duplication of dimensions and makes possible battery installations by releasing operator for loading other machines.

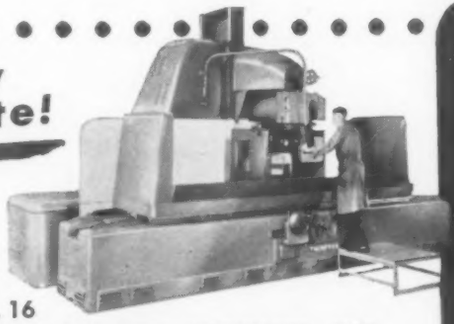
7. Anti-Friction Elevating Unit (exclusive Thompson feature). Friction between screw and nut is reduced 70% to permit accurate feeding to .0001". Also minimizes effort of moving saddle assembly when making new setups without power elevation. Permits inexperienced operators to finish work by following handwheel graduations.

8. Double-Length Bed (exclusive Thompson feature). Massive *double-length* solid-cast beds are provided with heavy cross-section and numerous ribs at vital points to provide absolute rigidity for table.

* * *

COPYRIGHT 1946
THE THOMPSON GRINDER CO. INC.

Before you buy **investigate!**

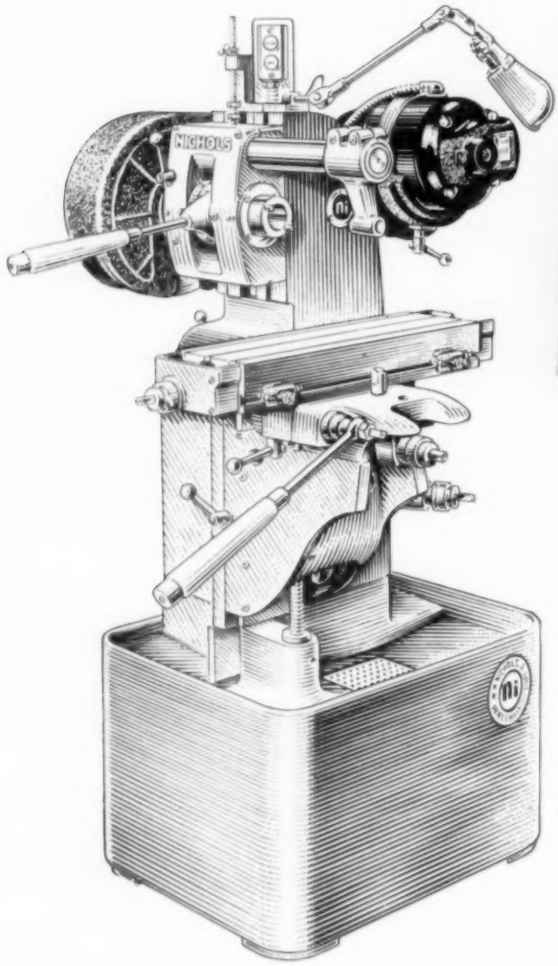


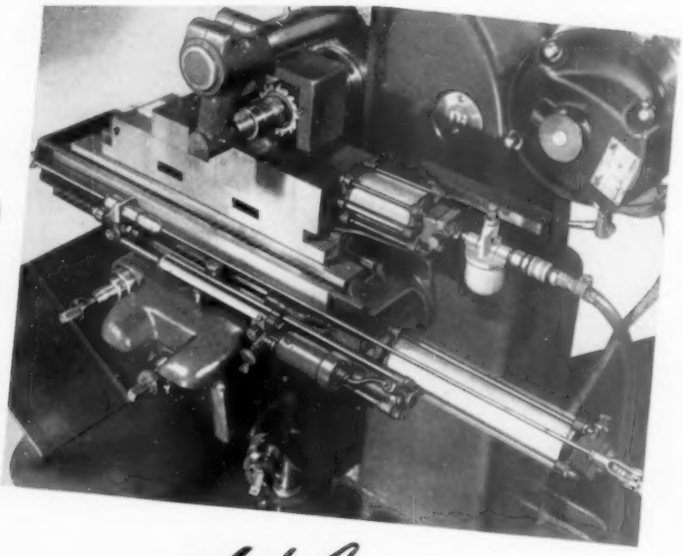
Thompson SURFACE Grinders

Address Dept. 16
THE THOMPSON GRINDER COMPANY, INC.
SPRINGFIELD, OHIO

New POWER FEED

can be added to...





the *Nichols* Miller

The new and proven power feed attachment substantially increases the value of any Nichols Miller as a production machine — yet does not limit its capacity as a tool room producer. The power feed is entirely automatic — the operator merely has to load and unload pieces and can, with ease, run two or more millers.

The power feed attachment is a Bellows air feed unit combined with a Hydro check. The design has several advantages. It gives a positive, but infinitely variable feed through the 6" maximum cutter stroke. Table advance and return are fast, and shut-off is automatic. It means the attachment is versatile — suited to any class of job within the capacity of the miller. The unit operates on regular shop air lines with 75 to 175 lbs. pressure.

Nichols Millers are famous for their precise production of tool room parts. Now, with the addition of power attachments, output can be multiplied to a mass production scale while tolerances are held to "tenths". Write today for complete details on this profit making attachment.

CONDENSED SPECIFICATIONS

Table Working Surface	6¾" x 21" or 30"
Longitudinal Travel (screw or lever)	10" or 19"
Transverse Travel (screw or lever)	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

ni

Send for free Nichols Miller Catalog

THE *Nichols* MILLER

MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 46 CHURCH ST., NEW YORK 7, N. Y.

THE OFFICE OF TOMORROW

is on the Press Today

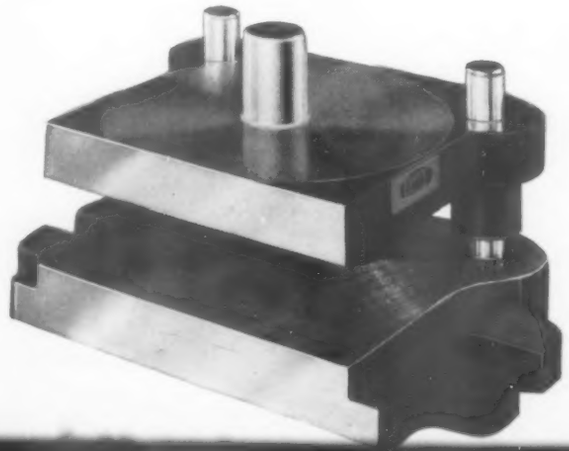
The clean lines and rounded contours of modern office furniture and equipment—the innumerable duplicated parts in typewriters, calculators and other office machines are ideally suited to Press Production. The Punch Press is the best and fastest method of duplicating parts for the vast field of industrial and business machines; and the entire Stamping Industry recognizes Danly Die Sets as vital in speeding die making programs, press production, and eliminating "downtime" because Danly means *known dependable accuracy*.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue · Chicago 50, Illinois

DANLY
National Assembly

Call Danly

- **MILWAUKEE 2** — *111 East Wisconsin*
- **DETROIT 16** — *1549 Temple Avenue*
- **CLEVELAND 14** — *1550 East 33rd Street*
- **DAYTON 2** — *990 East Monument*
- **ROCHESTER 4** — *16 Commercial Street*
- **PHILADELPHIA 40** — *3858 Pulaski Avenue*
- **LONG ISLAND CITY 1** — *47-28 37th Street*
- **DUCOMMUN METALS & SUPPLY CO.** — *4890 South Alameda, Los Angeles*



DIE MAKERS SUPPLIES

DANLY DIE SETS

Welded Steel Fabrication

GOVERNMENT-OWNED SURPLUS

STEEL... at quick sale prices!

STEEL can be bought now through War Assets Administration, for immediate shipment to you. Alloy steel billets, blooms and many items of alloy steel bars, particularly in the larger sizes, are available in Chicago, Cleveland, Detroit and other Regional Offices.

Lowscale prices make it worth your while to buy this high-grade material, even if you intend it for low-cost products.

Carbon and alloy steel mechanical tubing is also available in a wide range of sizes and specifications. Contact your nearest War Assets Administration Office below, or clip and mail the coupon.

FREE INFORMATION

To War Assets Administration:*

Please send me full information, including availability and pricing of the following:

Carbon and Alloy Billets and Blooms ☐—H. R. & C. R. Alloy Sheets ☐—Strip and Plates ☐—Stainless Steel Sheet and Strip ☐—Mechanical Tubing, Carbon and Alloy ☐—Standard Type Valves and Fittings ☐

NAME.....TEL. NO.....

FIRM.....

ADDRESS.....

CITY.....STATE.....

*Send coupon to nearest Regional Office below for fast service.

All steel is subject to priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area and then to purchase the material offered herein.

EXPORTERS

Most surplus property is available to the export market. Merchandise in short supply is withheld from export, and if such items appear in this advertisement they will be so identified by an asterisk.

WAR ASSETS ADMINISTRATION

GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane

157-6

LOOK FOR *This* NAME ON *Your* TAPS

It gives you positive assurance of clean, accurate threads at low cost per hole.

Plus

ALL THESE ADDED VALUES

COLD-TEMPER

Every Threadwell High Speed Tap treated at 120° below zero to give it extra hardness without brittleness.

GREASELESS RUST-PROOFING

that keeps Threadwell Taps clean and shining—never messy or sticky to handle.

POLISHED FLUTES

that provide extra protection against chip clogging and consequent tap breakage.

COLOR "I-DOT-IFICATION"

for instant identification of cut thread taps (red dot), commercial ground (white dot) and precision ground (blue dot).

PACKED IN TAP-CAPSULES

of transparent plastic that protect ground threads while making it easy to select type and size without unwrapping.

"PERSONAL ATTENTION" SERVICE

from the factory and from your Threadwell distributor so that your individual tap needs are promptly and efficiently met at all times.

REMEMBER: Threadwell COLD-TEMPER Taps cost no more than any other high speed taps. Why not try them and see what these advantages mean to you.

Threadwell Taps are sold exclusively through Mill Supply Distributors.

"DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT THE UNITED STATES AND THE WORLD"

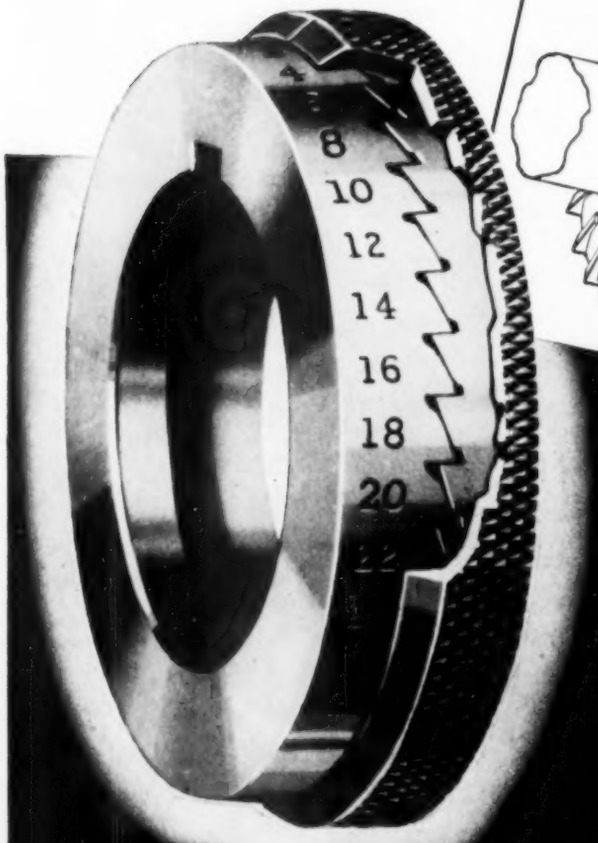
Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

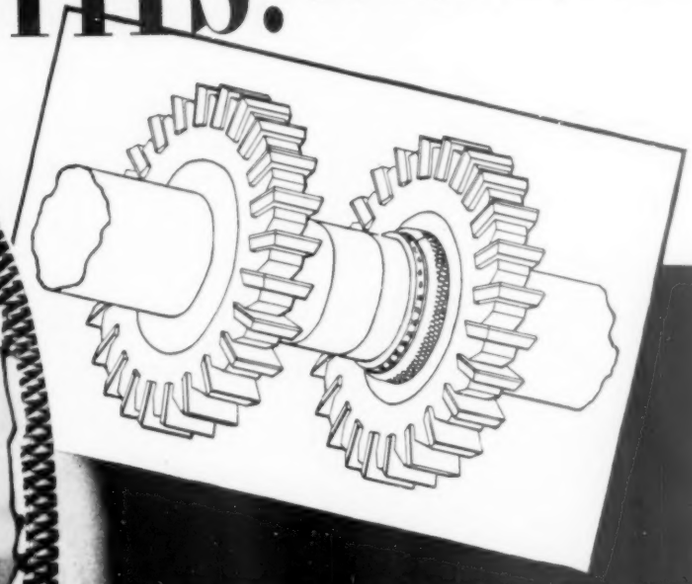
THREADWELL TAP AND DIE COMPANY · GREENFIELD, MASSACHUSETTS, U. S. A.

CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

GIVE 'EM FITS!

Here's how to "fit" the exact spacing requirements between cutters, in straddle or gang milling and multiple slotting setups.





S. J. Adjustable Spacing Collars

—manufactured exclusively by Scully-Jones, can be adjusted to make a perfect "fit," to the exact decimal space needed between cutters, without removing cutters from arbor to mount shims.

These adjustable collars have an expansion of .002" per step and a maximum expansion of .024". The teeth have a three-point bearing, at all times assuring uniform parallelism of the sides. They are hardened and ground and each tooth is ground on the side and face.

Count the Cost—Compare the Accuracy

—of Solid Spacing Collars made in your own shop—and you'll choose

S. J. Solid Spacing Collars

These Collars are carefully heat treated,* and widths are ground parallel to .0005 plus or minus.

Prompt delivery can be made on the standard sizes of S. J. Solid Spacing Collars.

*Except sizes of less than ⅛" thick.

See pages 128 and 129 Scully-Jones Catalog No. 500 for Adjustable and Solid Spacing Collars.

Write us for further information.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

1915 SOUTH ROCKWELL STREET • CHICAGO 8, U. S. A.

1918

NEW...

GREATER PRECISION AND PRODUCTION FOR TOOL ROOMS!

No. 22 Horizontal Boring, Milling, Drilling and Tapping Machine . . . for tool room work, light production and adaptable for making plastic molds.

- ★ Positive infinitely variable high speeds from 25 to 1600 R. P. M. in either direction directly on the main spindle giving complete range of speeds in one spindle.
- ★ 18 feeds in geometric progression, ranging from .002 to .125 per revolution of spindle. Five feeds are standard tapping leads.
- ★ Direct reading indicator for feeds and spindle speeds.
- ★ Speed and feed mechanism, and spindle housing are of unit construction.
- ★ Fast travel to all units.
- ★ Spindle and feed units run in bath of oil.
- ★ Column ways are extra wide . . . 5″ x 1½″ and 18″ across. Bed ways are 5″ x 1½″ and 24″ across. Table ways are 4″ x 1½″ and 22″ across.
- ★ Complete oversize construction to insure rigidity, strength and accuracy.
- ★ Extremely long saddle ways to support table.
- ★ 24″ x 36″ table has working surface of its entire area with "T" slots and cross slots.

Write for bulletin.
Defiance MachineWorks, Inc.,
Defiance, Ohio.

DEFIANCE

95 YEARS OF PRECISION MANUFACTURING

Wide and narrow Cone flat form tool holders
Wide and narrow Greenlee flat form tool holders
Right flat form tool holder for Gridley, Acme-Gridley, and New Britain Gridley
Left flat form tool holder for Gridley, Acme-Gridley, and New Britain Gridley
Cone dovetail tool holder
Dovetail tool holder for Greenlee machines
Dovetail form tool holder for Gridley, Acme-Gridley, and New Britain Gridley
Dovetail form tool holder for Gridley, Acme-Gridley, and New Britain Gridley
Circular forming tool holder for Gridley and Acme-Gridley
Circular forming tool holder for Gridley and Acme-Gridley

STANDARD TOOL HOLDERS
for
ALL AUTOMATIC
SCREW MACHINES

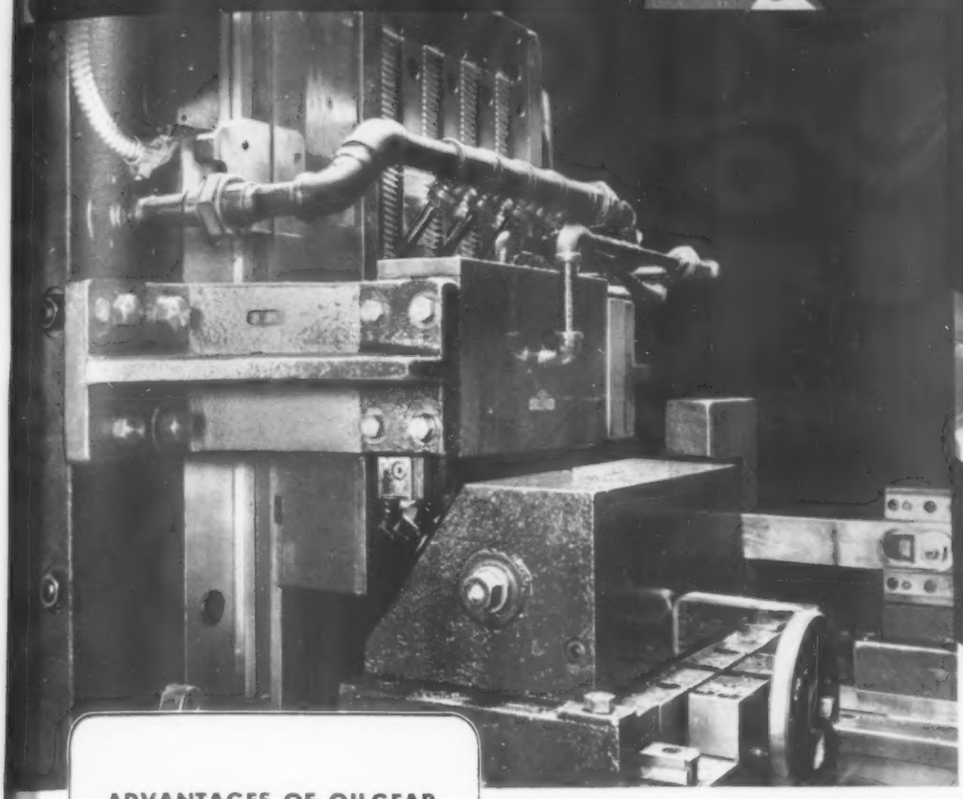
A great many screw machine users come to us with their *toughest problems* in designing tool holders. So well have we been able to satisfy their needs—often with one of our standard tool holders—that many standardize on our holders. They like the added advantage of our standard holders being interchangeable with present equipment without altering machine or tool.

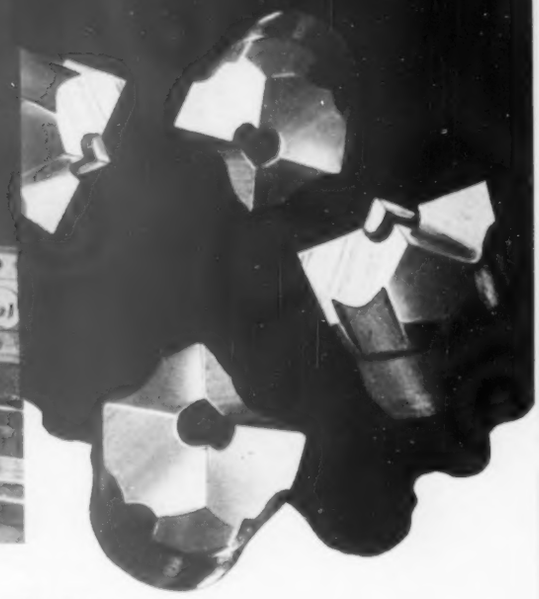
You too will find that our flat, dovetail, and circular tool holders perform a great many operations easier, quicker, more accurately. Deep keys and close tolerances guarantee alignment with the machine. Greater care in design makes them more convenient—easier to install. And the fact that we have over 400 models in stock makes deliveries quicker, costs lower.

SCREW MACHINE TOOL CO.
3365-73 GRATIOT AVENUE
DETROIT 7, MICH.

MORE GOLD...

with Oilgear Fluid Power Broaching





ADVANTAGES OF OILGEAR BROACHING MACHINES

High broaching speeds, higher return speeds. Infinitely adjustable cutting and return speeds. More efficient use of electric power permitting smaller motors. More efficient use of the fluid medium, allowing oil reservoirs as little as 1/5th the size of others; more compact and usable machines. Wide and roomy tool slides and shuttle tables, manual, semi-automatic and full-automatic cycle control at no extra cost. Positive control interlock with fixture operation.

OILGEAR

In 1938, an Oilgear Surface Broaching Machine was sent up into the wilds of Canada, hundreds of miles from anywhere. It was to try its hand at sharpening rock drill bits used in Hollinger Consolidated Gold Mines Ltd. operations as against both hot milling and conventional steel sharpening.

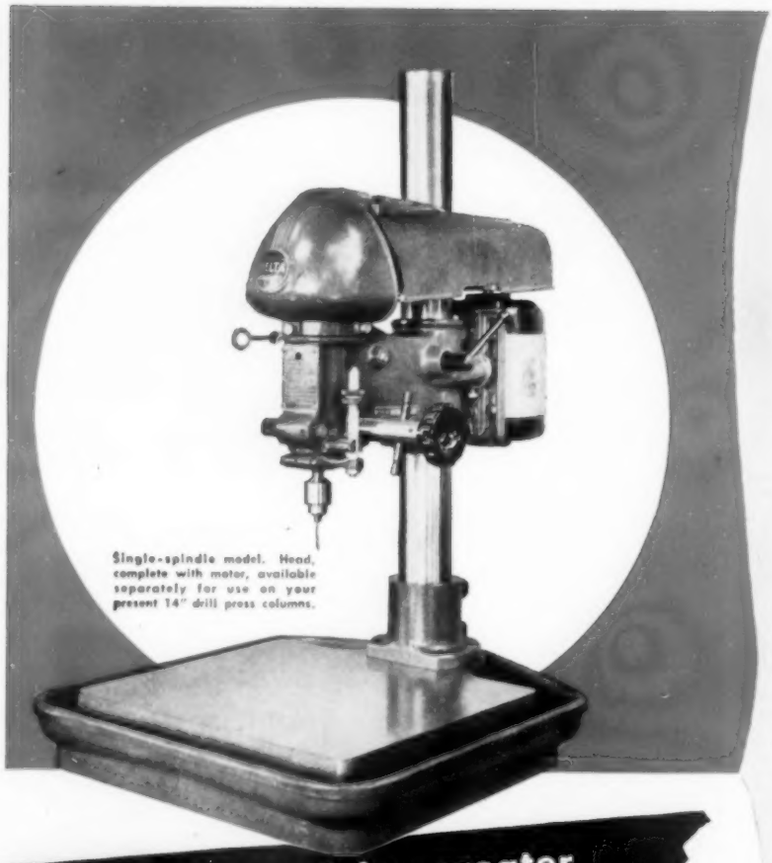
Here is what happened: to date, this single machine has sharpened more than 4 million 551 thousand bits. It sharpens 175 bits per hour as against 70 by the hot milling method. With two men for the broaching and turning operations, it equals the output of three of the conventional steel sharpening machines with six men. Oilgear Broaching takes off less metal, yet gives sharper, cleaner edges, more efficient drilling. It averages 25,000 drill bits per tool regrind. Aside from a minor pump adjustment on March 18, 1939, it has required no maintenance whatsoever.

"(The) performance (of this Oilgear Broach) has been the main factor in our choice of another Oilgear machine for future operations," writes Mr. F. Wolnod of the Hollinger Company.

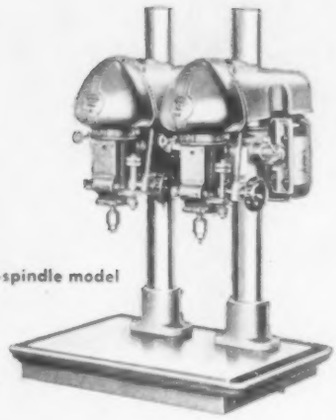
The gold you dig for may not come from mines. But you will get *more* "gold" if you turn to Oilgear Fluid Power Broaching. THE OILGEAR COMPANY, 1308 W. Bruce Street, Milwaukee 4, Wisconsin.

Oilgear manufactures a complete line of broaching machines . . . horizontal and vertical for every internal and external broaching operation.

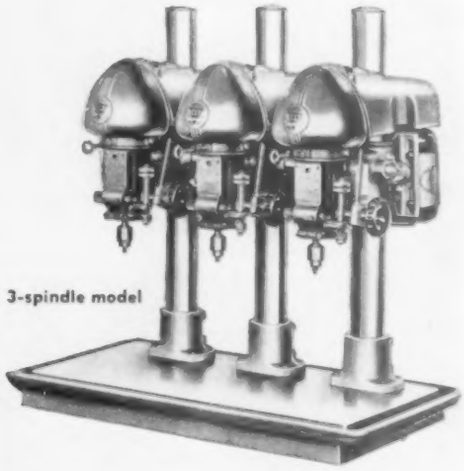
Oilgear Fluid Power



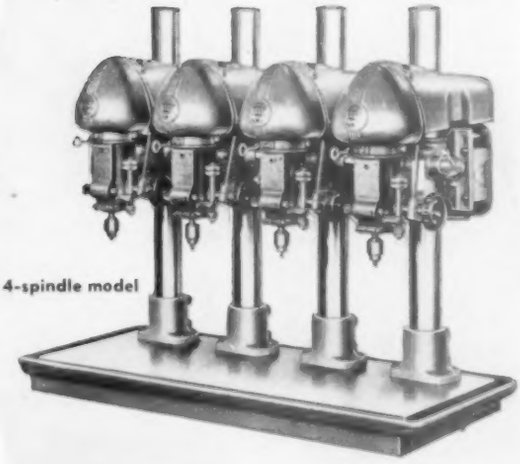
Single-spindle model. Head, complete with motor, available separately for use on your present 14" drill press columns.



2-spindle model



3-spindle model



4-spindle model

A low-cost tool for greater accuracy on sensitive drilling from .025" to ¼" diameter...

Delta-Milwaukee Super-Hi-Speed Drill Press

Embodies all the well-known construction features and operating advantages of other Delta-Milwaukee drill presses

Now — a high-speed drill press by Delta-Milwaukee, for greater precision on small-hole drilling of plastics, aluminum, and other metals. Drills to the center of a 14" circle.

Famous Delta-Milwaukee features include: Lubricated-for-life ball bearings, double-sealed against harmful abrasive dust . . . Preloaded ball bearings . . . Precision-ground spindles . . . Dynamically-balanced pulleys . . . Dynamically-balanced motor . . . Specially-selected Jacobs chuck.

Single-spindle model, with production table. 2-spindle, 3-spindle, and 4-spindle models, with sectional tables. Head, complete with motor, available separately for special set-ups. Three-step pulley permits spindle speed range of 12,000 . . . 8000 . . . 5000 R.P.M. Full spindle travel is 2¼".

See your nearby Delta industrial distributor for the complete story on the new Delta Super-Hi-Speed Drill Press.

Send for free catalog that pictures and describes the entire line of compact, portable, low-cost Delta-Milwaukee Machine Tools. Use coupon below.

DELTA MILWAUKEE
REG. U.S. PAT. OFF.

M-17

[Tear out coupon and mail today]

THE DELTA MANUFACTURING CO.
611 K E. Vienna Ave., Milwaukee 1, Wis.

Please send me free copy of catalog on low-cost Delta-Milwaukee Machine Tools.

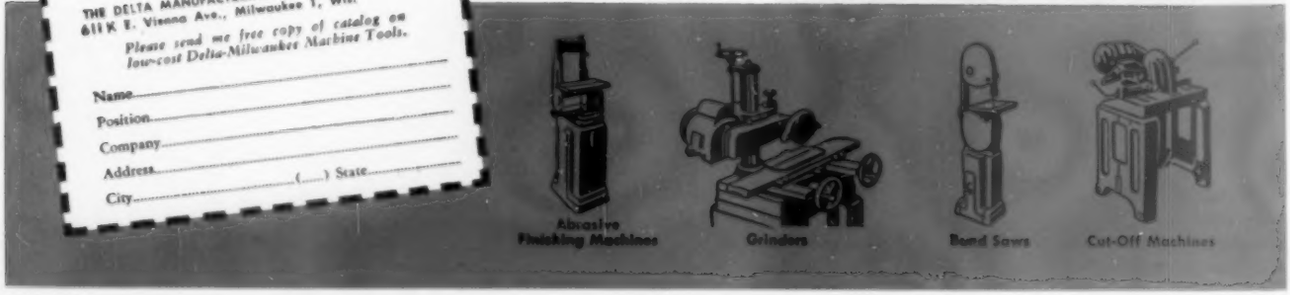
Name_____

Position_____

Company_____

Address_____

City_____ (____) State_____



Abrasive Finishing Machines

Grinders

Band Saws

Cut-Off Machines

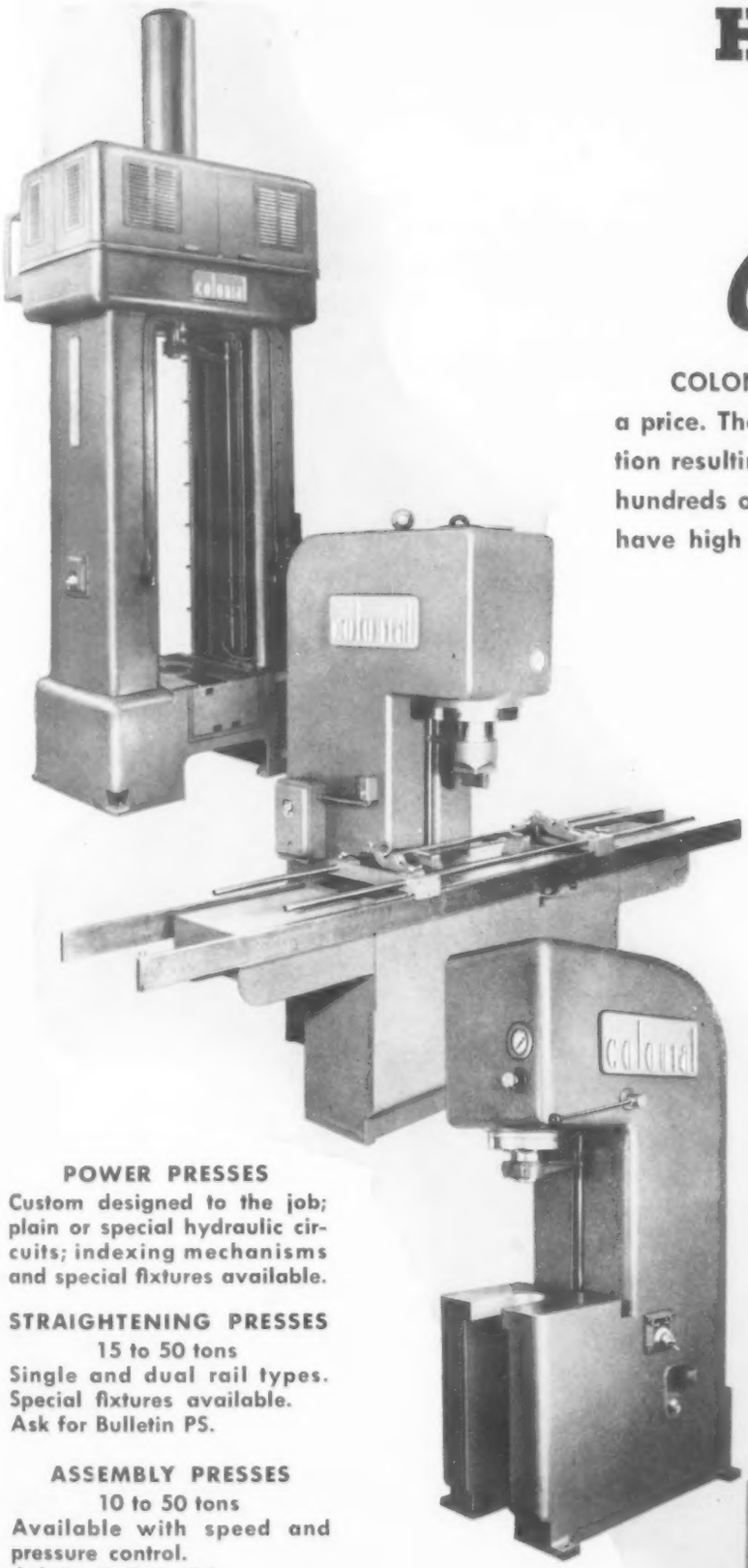
HYDRAULIC PRESSES

by

Colonial

COLONIAL hydraulic presses are not built to a price. Their low cost is due to quantity production resulting from their universal applicability to hundreds of different types of jobs. All machines have high overload reserve capacity.

For broaching
for assembling
for straightening
for forming
for punching
for plastics work
for aluminum and magnesium



colonial
BROACH COMPANY
Box 37, Harper Station Detroit 13, U. S. A.

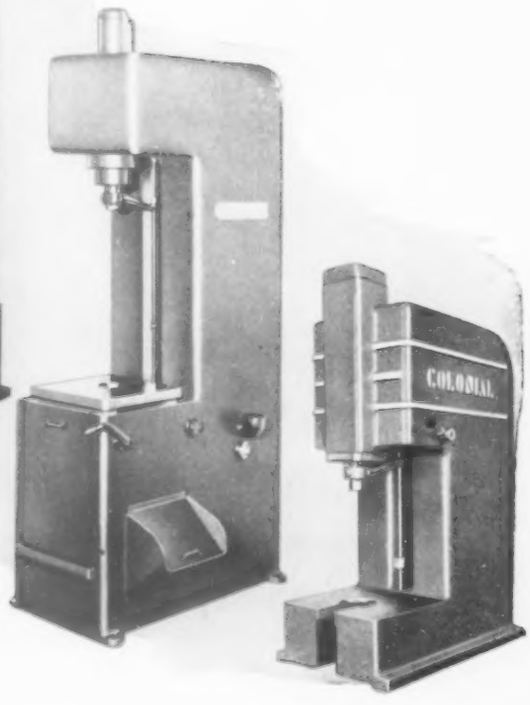
POWER PRESSES
Custom designed to the job; plain or special hydraulic circuits; indexing mechanisms and special fixtures available.

STRAIGHTENING PRESSES
15 to 50 tons
Single and dual rail types.
Special fixtures available.
Ask for Bulletin PS.

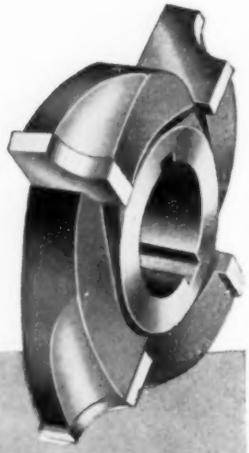
ASSEMBLY PRESSES
10 to 50 tons
Available with speed and pressure control.
Ask for Bulletin PA.

"UTILITY" PRESSES
4 to 10 tons
Available with speed, pressure and dual safety controls; pulldown attachment.
Ask for Bulletin VBS.

"JUNIOR" PRESSES
1 to 4 tons
Available with pedestal and with straightening or pulldown attachment.
Ask for Bulletin VJ-1.

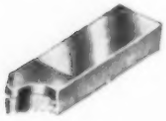


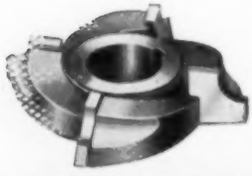
For FASTER
SMOOTHER CUTTING,
LONGER LIFE and
BETTER FINISH—



Meyers

Carbide Tipped FORM TOOLS



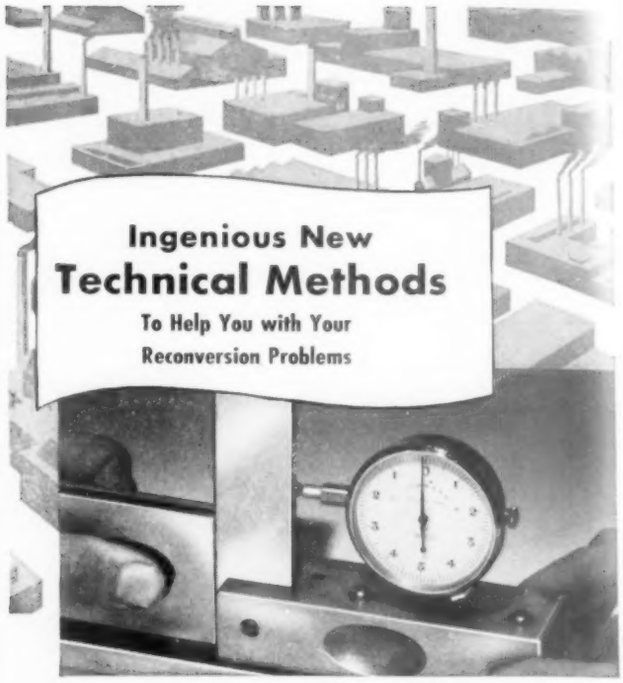


The Meyers method of generating carbide-tipped tools insures the accuracy of each radius. On milling cutters all teeth are precisely uniform, thereby distributing the work evenly over the entire cutter. This accuracy and uniformity increases the life of the tool amazingly, and insures a much better finish on the work.

We are equipped to grind tools to your specifications, and to engineer special tools for your particular job. Write for complete information, or send us your prints for a quotation.

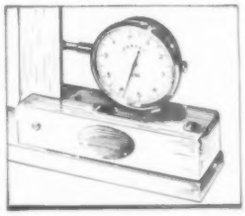
W. F. MEYERS CO., INC.
ESTABLISHED 1888

1024 14th Street *Bedford, Indiana*



New Micro Square Instantly Checks Right Angles to One 10,000th Inch!

Ideal for precision testing, the Acro Micro-Sine Square quickly and accurately checks right angle work to 1/10,000th inch within a given distance. Its standard indicator dial instantly registers error, location of error, and amount of correction required. Designed for tool and die shops, machine shops and testing laboratories, it also provides a standard for checking master squares, tri-squares and tools.



Standard Indicator Dial

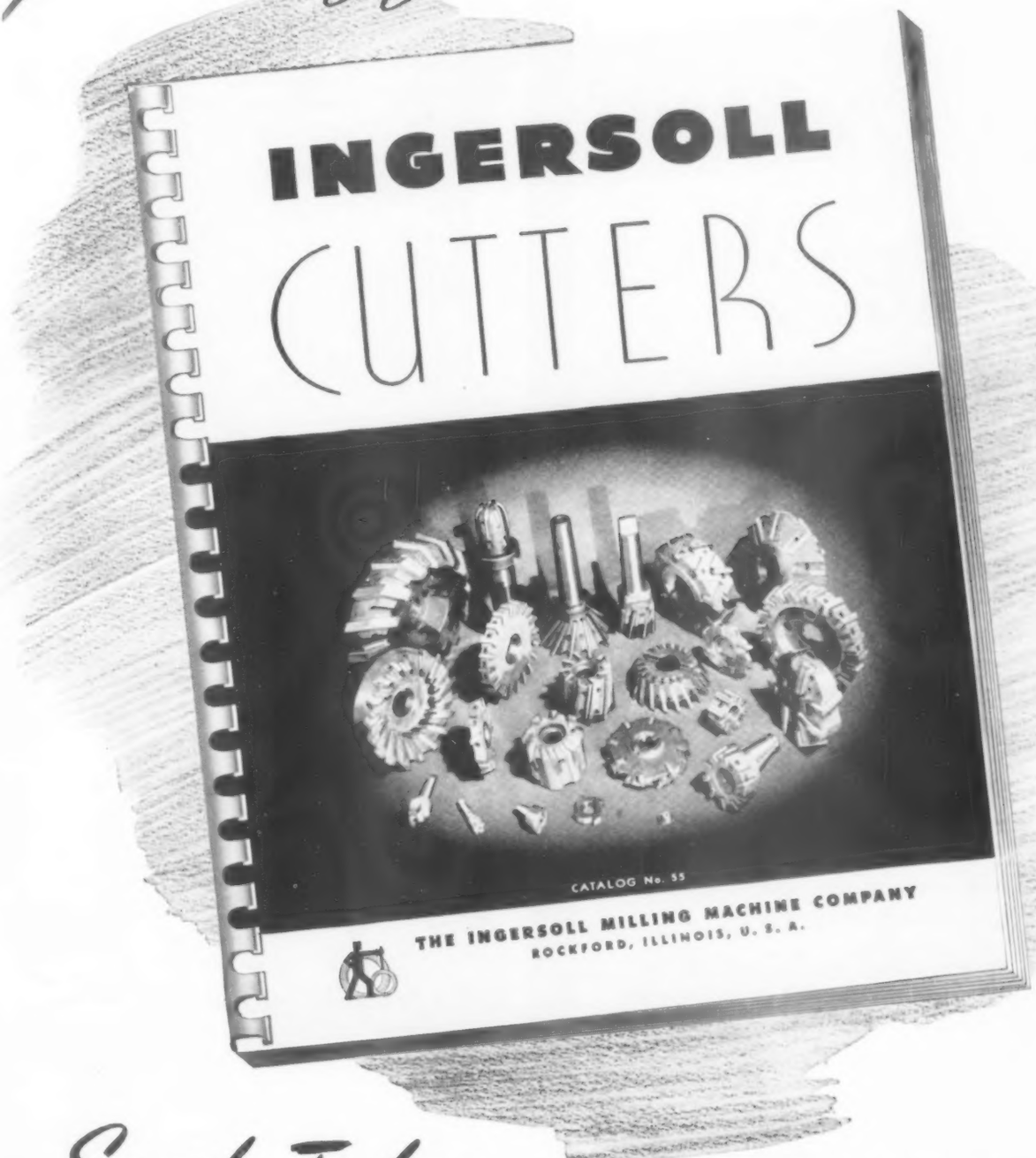
The Acro Micro-Sine Square is very simple to operate, saves hours of time. Made of hardened tool steel, in ground and lapped precision construction. Available in two types: (1) Standard precision gauge in tenths, (2) Lever indicator in thousandths. Both complete with master checking blocks and carrying cases.

On precision jobs, requiring a static position and mental alertness, workers undergo nervous tension which often results in fatigue. Tests have shown that the act of chewing helps relieve tension—helps workers stay alert, thus increasing their efficiency to do more accurate work. For this reason, many plant owners urge workers to chew Wrigley's Spearmint Gum on this type of job.

You can get complete information from
Acro Tool and Die Works
4554 Broadway, Chicago 40, Illinois

AA-89

Just Off the Press!



Send Today... FOR YOUR COPY

of this new Ingersoll Cutter Catalog

THE **INGERSOLL** MILLING MACHINE CO., ROCKFORD, ILL.

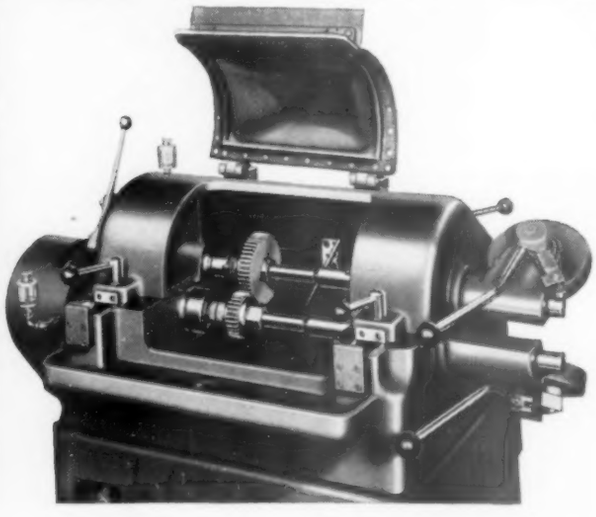
Builders of Inserted Blade Milling and Boring Tools

Don't Let NOISY GEARS Reach Assembly

There is no excuse for incorporating noisy gears in any assembly where gear noise cannot be tolerated. Find out before those gears reach assembly whether or not they are noisy and avoid the necessity of tearing down the assembly in order to replace them with quiet gears.

That is precisely the function of The Red Ring Gear Sound Tester. It will always spot noisy gears. Furthermore, it will indicate the nature of the trouble which causes the noise so that it can be corrected.

The acoustical horn of this machine amplifies gear noise 50 times. Center distance between gears in the sound chamber may readily be set with precision gage blocks. Gears may be tested either with or without brake load.



NATIONAL BROACH AND MACHINE CO.

1806 **5600 ST. JEAN** *RED RING* ◯ *PRODUCTS* **DETROIT 13, MICH.**

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

Hammond

of KALAMAZOO

CARBIDE GRINDERS

A MODEL FOR EVERY NEED

10" WET or DRY GRINDERS
Hammond makes a complete line of Wet or Dry Carbide Grinders for 6" to 14" wheels.

HEAVY DUTY CHIP BREAKER
For fast, smooth, accurate, vibrationless operation.

WRITE FOR BULLETIN

Hammond Machinery Builders INC

1661 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

DRILL JIG BUSHINGS

Accurate

Interchangeable

Concentric

Acme Industrial Company

200 N. LAFLIN ST.
CHICAGO 7, ILLINOIS

WRITE FOR FREE CATALOG!

TAPPING TIPS

From Woody Spencer's Notebook

CHECK AND DOUBLE CHECK!

Tapping troubles come sometimes because something or other isn't right before we start. 'Course, making sure the tap is right is plain common sense. But taking a little time to check other things always pays. For instance, is the hole size right? Is it perfectly round? Is your alignment correct, both tap and jig? If the hole is blind is there chip room at the bottom? Is the lubricant right? Is it clean and cool? How about speed?

Sound silly? Well maybe it does. But you know and I know how much some little thing like one of these can affect the job. So, to do better tapping, faster, make sure you are right first.

Woody Spencer's Tapping Tips aren't run here to offer any technical advice on tapping. They're just a series of hints, short cuts and ideas Woody has picked up in his rounds among the shops. And he puts them in here for whatever they're worth, just to help to make some routine tapping job run a little smoother. If they do that, we feel they're well worth while.

But for the technical questions that come up—look to the engineers. Send us complete information on the job—material, diameter of hole, depth of thread, through or blind, lubricant used, etc. Our engineers will be glad to give you definite suggestions covering your problems.

NOTE: Woody Spencer's Tapping Tips will appear here as often as Woody gets time to write them up. Look for them.

Woody Spencer's Handy Tap guide is packed with useful information on tapping. It's free. Write for your copy on the Company letterhead.

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio

You're Looking into the "COCKPIT" of a HEALD BORE-MATIC

. . . where special tool indicators assure finer production . . . faster . . . at lower cost

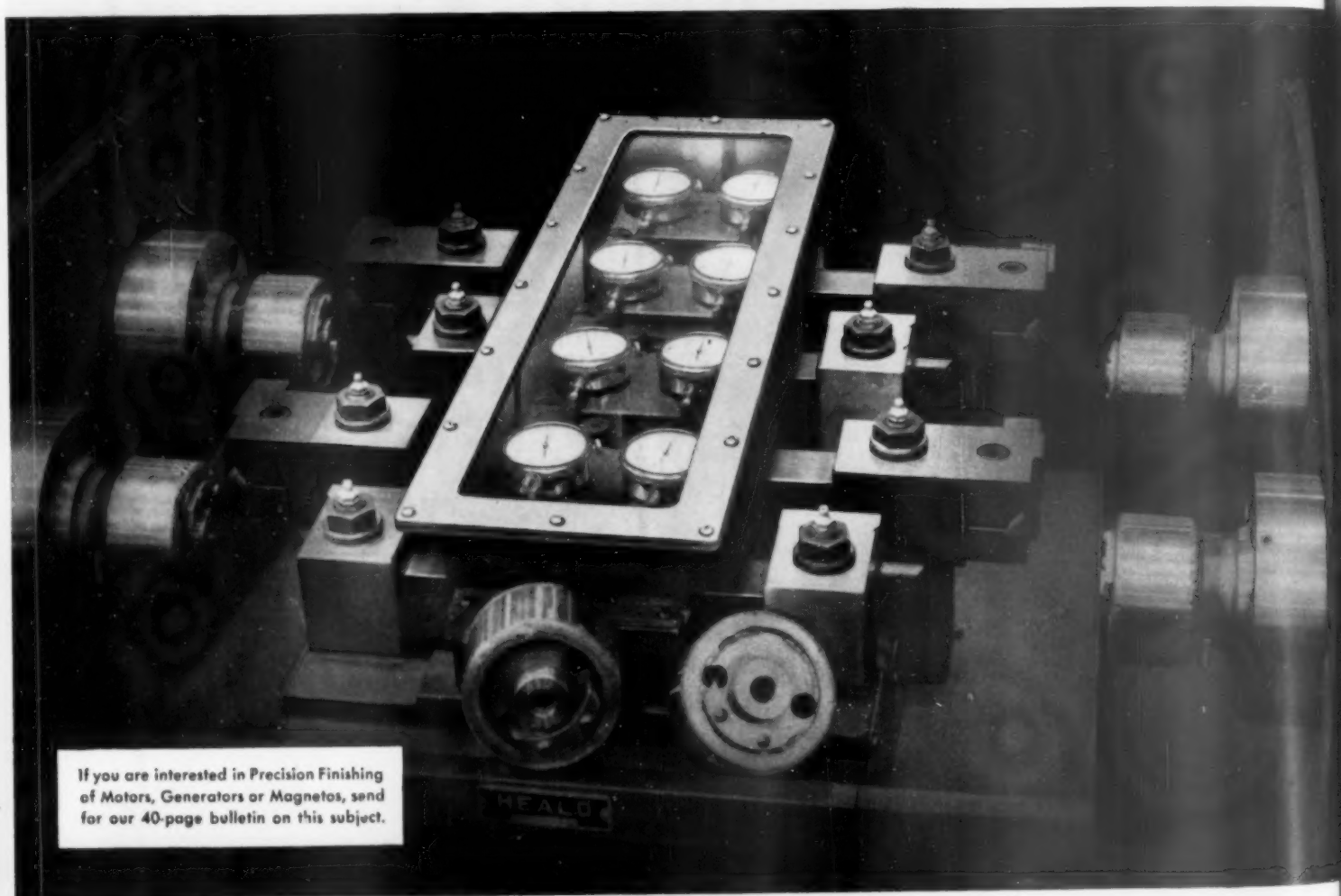
Just as an airplane instrument panel reveals the smallest variance in flight, so this special arrangement of sensitive tool indicators on a Heald Double-End Bore-Matic accurately checks the tools for machining of refrigerator rotors to precision tolerances. Each of the four stations is provided with two dial indicators, one measuring the setting of the turning tool, and one the boring and chamfering tools. These indicators immediately point out machining errors—allow tool adjustments to be made quickly, accurately, easily. Result? Big savings in down time that mean a higher volume of output, and a lower percentage of costly rejects.

In another case, a manufacturer of electric motor parts found his rotor wheels loading with soft aluminum during grinding. He consulted Heald engineers, who showed him how to precision turn the rotors two at a time on a Heald Bore-Matic. Production rose from 70 parts an hour to 200!

Whatever your precision finishing problem, the chances are that experienced Heald engineers have the answer, and can design the right equipment to give you greater production at lower unit costs. For further information, write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision . . . less cost

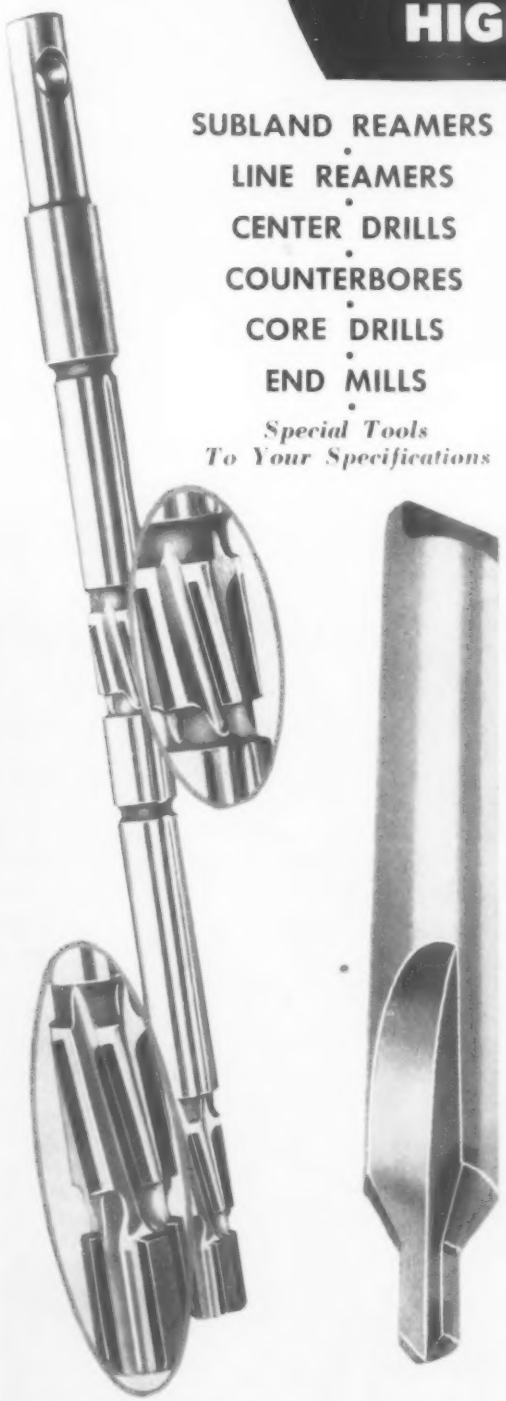


If you are interested in Precision Finishing of Motors, Generators or Magnetos, send for our 40-page bulletin on this subject.

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

Now!

CARBIDE-TIPPED TOOLS
BRAZED OH HARDENED
HIGH-SPEED STEEL BODIES



SUBLAND REAMERS
•
LINE REAMERS
•
CENTER DRILLS
•
COUNTERBORES
•
CORE DRILLS
•
END MILLS
•
Special Tools
To Your Specifications

AGAIN, Detroit Reamer & Tool Company sets the pace in metal cutting tools, with brazed carbide tips on hardened high-speed steel bodies, so that the total length of the flutes and pilots will Rockwell C-62-63.

It has also been proven in actual practice that this type of tool has a higher cutting efficiency due to the harder background for the carbide tips which produces less "spring-back" under heavy cuts for this same reason. Also, the flutes and pilots will not "score" or pick up due to the hardness of the high-speed steel and long wear on the pilot.

All of these outstanding advantages, together with longer tool life and reduced production costs, are at your disposal with Carbide Tipped Cutting Tools, with HIGH-SPEED STEEL BODIES.

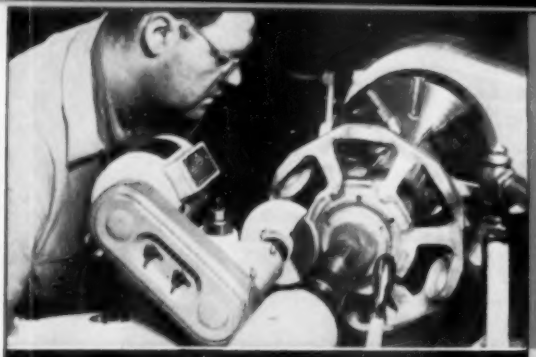
• MADE TO YOUR SPECIFICATIONS •

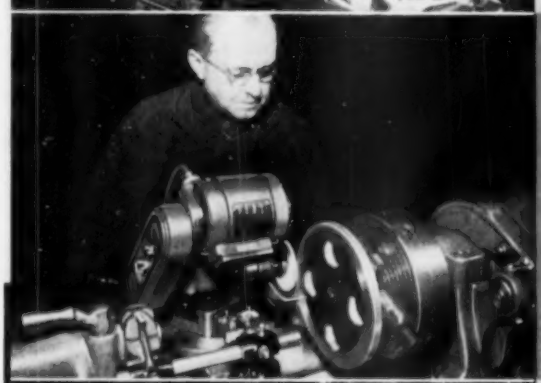
Write for QUOTATION

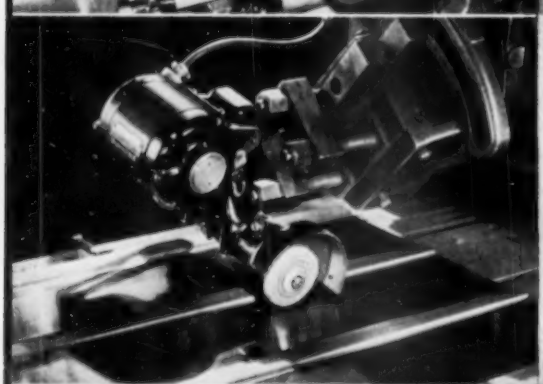
DETROIT REAMER & TOOL CO.

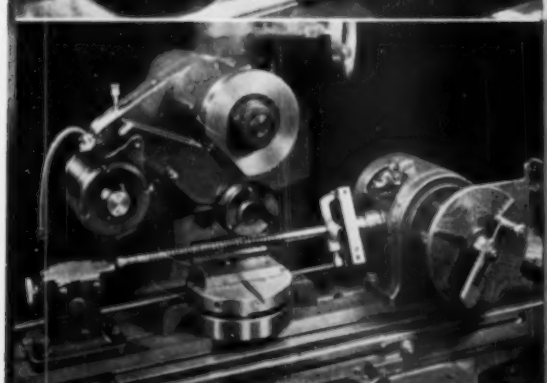
2830 E. Seven Mile Road **Detroit 12, Michigan**

Manufacturers of Oil-Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools









A Dumore cuts your costs by doing all 5 Grinding Jobs

1 external 2 internal 3 thread 4 surface and 5 tool grinding

You don't have to invest in five expensive machines to have complete grinding facilities. You can do all types of grinding by mounting a Dumore on a lathe, milling machine, or other basic tools you already have.

Quickly set up for varied maintenance and toolroom tasks, dependable at steady production schedules, accurate to .0001" — Dumore will simplify your grinding problems and cut your grinding costs.

Seven different models offer a power range from 1/14 to 1 HP with speeds up to 42,500 RPM. Interchangeable quills extend the capacity of individual grinders for internal work to a maximum depth of 24 inches. There is a size and type Dumore for every grinding need.

Let your local distributor tell you the complete story of cutting costs with a Dumore. *You may find a solution to your own problem* in his data file of Dumore grinding methods. To add a valuable reference book to your own file, send the coupon below to The Dumore Company, Dept. 142, Racine, Wisconsin.

D-1

TEAR OUT COUPON AND MAIL TODAY!

FREE 76-page, illustrated grinding methods manual...

THE DUMORE COMPANY, Dept. 142
Racine, Wisconsin

Please send without obligation my copy of *Here's How*, your manual of the newest techniques in grinding.

Name..... Position.....

Company.....

Address.....

City..... (.....) State.....

DUMORE
PRECISION TOOLS

SOLD BY LEADING INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES

SPECIAL TAPS *can cost less than* STANDARDS

It is frequently more economical to use a special Detroit tap than a lower cost "standard". Reason for this is that DETROIT really designs specials "to the job". At Detroit that means taking into account not only general thread specifications, but characteristics of the materials to be tapped, tolerances required, whether another operation—such as drilling or reaming, or a second tapping operation—can be performed by the same "special".

It would be difficult to determine whether the machines which Detroit Tap and Tool has developed for producing all kinds of specials or the knowledge of tap design problems presented by different materials are more responsible for the outstanding success of DETROIT specials.

Our extensive field engineering force, as well as our Detroit design engineering staff are at your disposal. They will be glad to help you cut machine hours, reduce rejections, eliminate operations and improve the quality of your tapped holes.

Send us a part print of that "tough" job today

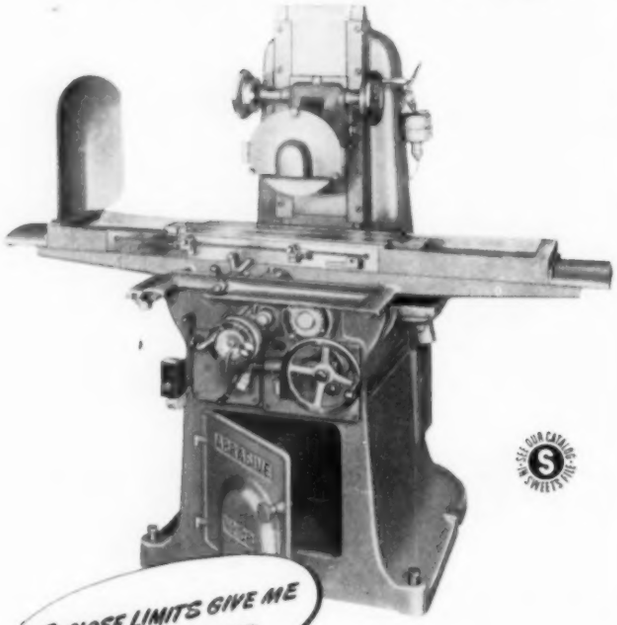
DETROIT

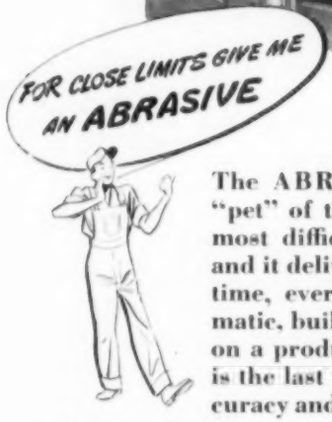
TAP & TOOL CO.

8432 BUTLER AVE. • DETROIT 11, MICHIGAN

ABRASIVE 3-B

SURFACE GRINDER





The ABRASIVE 3-B is the "pet" of the shop. It gets the most difficult, precise jobs — and it delivers perfect work on time, every time. Fully automatic, built for precision work on a production basis, the 3-B is the last word in grinding accuracy and efficiency. Its many features include: one-piece, heavily ribbed bed casting; motorized spindle mounted in massive head to provide more power and minimize vibration; vertical feed dial accurately graduated to .0001"; hydraulic shock absorber to cushion table reversal.

SPECIFICATIONS

WORK CAPACITY:

24" long 8" wide 12" high

Wheel Size 10"

Table Size Overall 59" x 10½"

Net Weight 2670 lbs.

Write for complete Bulletin

ABRASIVE MACHINE TOOL CO.

EAST PROVIDENCE 14, RHODE ISLAND

For information regarding Abrasive Machines on the Government Surplus Tool List, send us the serial number of the machine. We will endeavor to provide attachments, accessories and repair parts as desired.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

Service WITH A PUNCH!

• Allied's R-B Interchangeable Punch and Die is "standard" in metal working and plastic industries. Standard shapes and sizes carried in stock. Illustrated are four of the thousands of specially-designed punches we have made. Special R-B punches and dies made in any material, shape or size desired. Send for large, illustrated R-B catalog, now.

ALLIED PRODUCTS CORPORATION

Dept. 28-E • 4630 Lawton Ave. • Detroit 8, Mich.

MOTOR DRIVEN CENTRIFUGALS

Nos. 240 and 245

EASY TO INSTALL AND MAINTAIN

flexible positioning . . . Can be mounted in variety of positions . . . from vertical to horizontal . . . discharge port at any 45° angle with suction and at any 90° position with conduit box. For standard machine equipment and where space is limited or power take-off is not available. Ask your distributor for complete information. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

B·S

GEARED • VANE • CENTRIFUGAL • MOTOR DRIVEN

BROWN & SHARPE PUMPS

MICROHONING

is the Quicker, Better, Lower Cost Method

For Example:

THIS 4130 STEEL ROCKET TUBE, ROCKWELL 34-38C

Size: 4.220″ diameter x 20.5″ long.
Preceding Operation: Diamond Bore.
Average Stock Removed: .030″ on diameter
Average Time: 5.45 minutes
Average: 1.5 cubic inch per minute.
Average: .0055″ on diameter per minute.

Another Example:

Aircraft Propeller Blade Tubing

Size: 8.000″ diameter x 96″ long.

Preceding Operation: Drawn Seamless Tubing with scale in bore.

Average Stock Removed: .050″ to .080″ on diameter (approximately 156 cubic inch in bore).

Average Time Required: 65 minutes.

2063

MICROMATIC HONE CORPORATION • DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, Cal. • 194 Dalhousie St., Brantford, Ont., Can. • 616 Empire Bldg., 206 S. Main St., Rockford, Ill. 501 Harries Bldg., 137 No. Main St., Dayton 2, Ohio • 927 A—M & M Bldg., P.O. Box 981, Houston 2, Texas • Room 514—129 Church St., New Haven 10, Conn.

TOOLS for PRECISION PRODUCTION

Reciprocating Action (In and Out)

PORTABLE *Electric* **RECIPROCATING TOOL**

Motion is "in and out"—not spinning or rotary. Tool is portable—light weight—carry it anywhere—easy to handle. Self contained. Ready to plug into any 110 volt electric outlet. Use it to work on any metal, wood, plastic or other materials that may be filed, sawed or polished. Delivers 1000 strokes per minute, much faster than hand methods. Complete line of files, scrapers, hones and other accessories available.

AIR GUNS

THE ONLY AIR GUNS WITH ENCLOSED LEVER CONNECTED TO THE VALVE BY A BALL AND SOCKET JOINT.

Valve completely enclosed. Eliminates Packing Glands.

Slight movement of lever gives complete discharge.

FEATURES THAT MAKE IT THE CHOICE OF THE MOST MODERN PLANTS

- Leakproof
- Streamlined to Hose
- Instant, Positive Shut-off
- Simple Design
- Low Maintenance
- For Air or Water

PRECISION BUILT SMALL REAMERS

High Speed and Carbide Tipped

1/32" to 5/8" Diameter

If you are finishing holes to decimal tolerances or ANY part that calls for extreme reaming accuracy, we are especially equipped to produce the reamers required: Straight, Spiral, Step, Pilot, Hand.

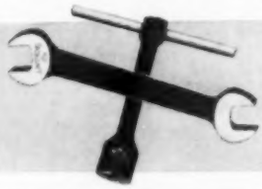
PROMPT DELIVERY
Write For Literature

PRECISION PRODUCTION TOOLS

ACME TOOL COMPANY

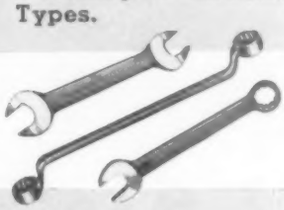
96 WARREN STREET • NEW YORK 7, N. Y.

ARMSTRONG *Top Quality* WRENCHES



Armstrong Drop Forged Carbon Steel Wrenches including 19 different Types.

Armstrong Drop Forged Alloy Steel Wrenches including 12 different types.



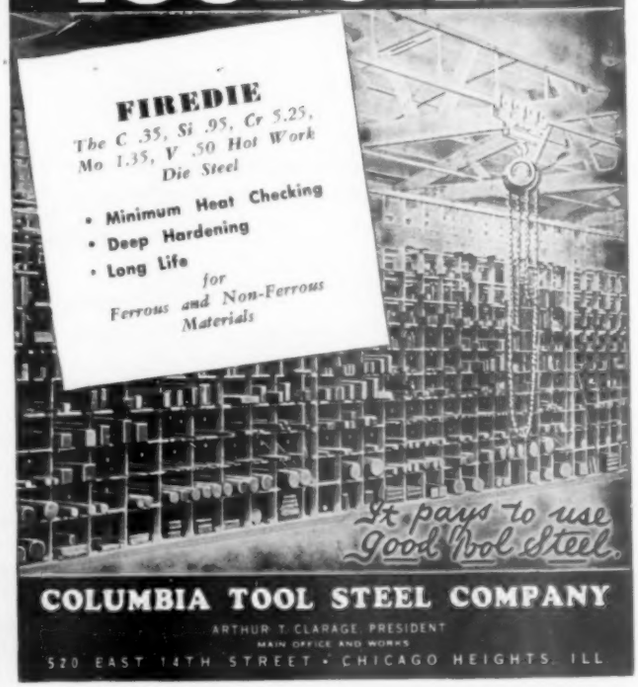
Armstrong Alloy Steel Detachable socket wrenches and driving units . . . a complete assortment of sets.

For Construction, Armstrong Drop Forged Ratchets, Construction and Structural wrenches in both Carbon and Alloy.

ARMSTRONG BROS. TOOL CO.

337 N. FRANCISCO AVE., CHICAGO 12, U. S. A.
Eastern Warehouse and Sales Office, 199 Lafayette St., New York, N. Y.
Western Warehouse and Sales Office, 1275 Mission St., San Francisco, Calif.

Columbia TOOL STEEL


FIREDIE
The C .35, Si .95, Cr 5.25, Mo 1.35, V .50 Hot Work Die Steel
• Minimum Heat Checking
• Deep Hardening
• Long Life
for
Ferrous and Non-Ferrous Materials
It pays to use Good Tool Steel

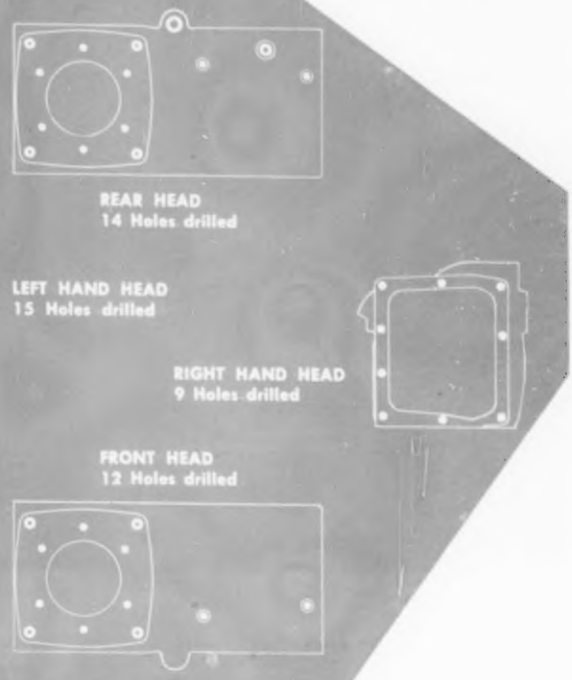
COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

2600 HOLES DRILLED *Per Hour*

IN TRACTOR TRANSMISSION CASES*

The machine pictured here is a four-way NATCO HOLEUNIT machine for drilling fifty holes in four faces of tractor transmission case at the rate of 52 transmission cases per hour . . . A TOTAL OF 2600 HOLES DRILLED EVERY HOUR. The diagram above shows the holes drilled in the four faces.



Hole sizes vary from 1/4" to 15/16"

These NATCO machines are engineered and built for specific jobs of processing multiple holes automatically, thereby increasing production and reducing hole costs. Accurate work is assured because the skill is built into the machine and the opportunity for human error is held to a minimum. Submit blue prints or specifications of your drilling, boring or tapping work . . . our engineers will study your problem and submit their recommendation without obligation to you.

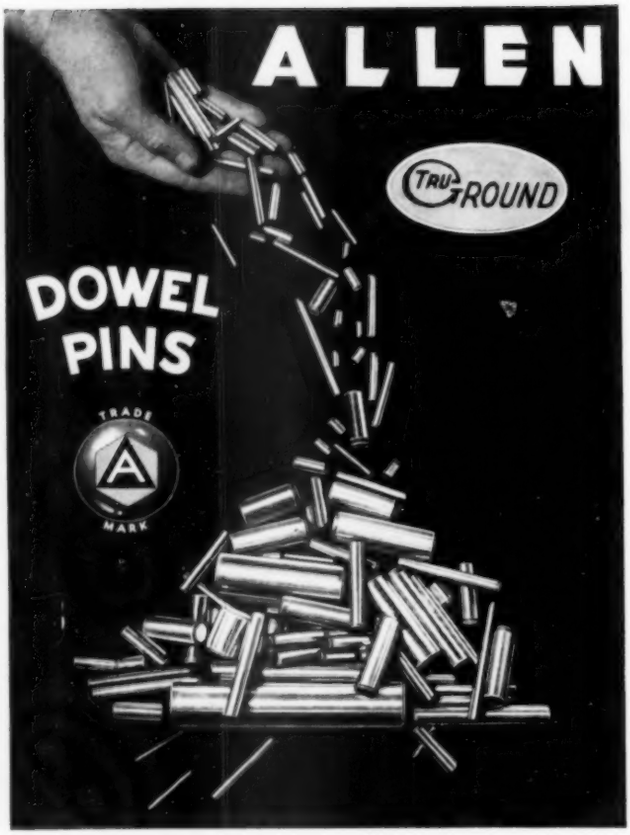
**Four sides of each transmission case drilled simultaneously.*

Write, wire or phone a NATCO Field Engineer for a summary of your "HOLE" problem.

NATIONAL AUTOMATIC TOOL COMPANY, INC.
RICHMOND, INDIANA, U.S.A.

MULTIPLE DRILLING, BORING AND TAPPING MACHINES

SALES OFFICES: 1809 ENGINEERING BUILDING, CHICAGO; 469 NEW CENTER BUILDING, DETROIT; 1807 ELMWOOD AVENUE, BUFFALO; 2902 COMMERCE BUILDING, NEW YORK CITY.



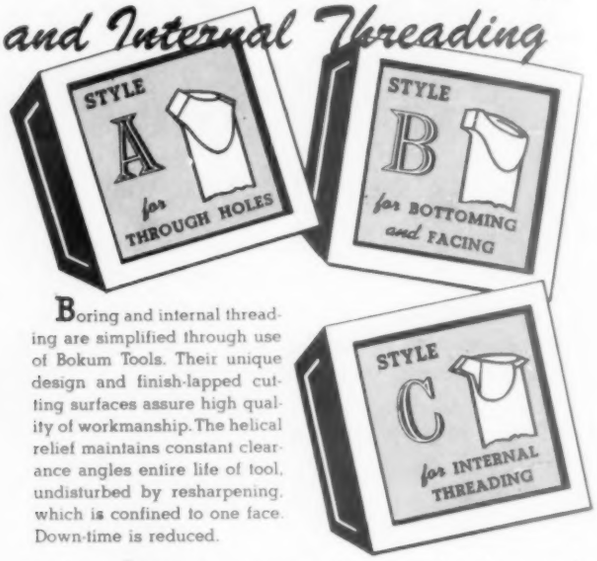
They serve as locating pins for the diemaker's work — and function further as perfect shafts for pins and pivots in various machine assemblies.

Accurate to a limit of .0002″ over basic size, with allowable tolerance of plus or minus .0001″. Ground, polished surfaces, treated with rust-preventive. Heat-treated to an extremely hard exterior, with core of the right hardness to prevent "mushrooming" when driven into a tight hole. Tensile strength, 240,000 to 250,000 p. s. i. Steeled to *retain* precision standards in tool and die work; special-analysis ALLENOY steel used exclusively.

Ask your local ALLEN Distributor for samples and dimensional data . . . the same Distributor who serves you dependably with Allen Hex Socket Screws and other first-call mill supply items.

THE ALLEN MFG. COMPANY
HARTFORD, ★ **ALLEN** ★ CONN.

The ABC of Boring and Internal Threading



Boring and internal threading are simplified through use of Bokum Tools. Their unique design and finish-lapped cutting surfaces assure high quality of workmanship. The helical relief maintains constant clearance angles entire life of tool, undisturbed by resharpening, which is confined to one face. Down-time is reduced.

You're overlooking the opportunity for increased production and higher efficiency if you are not acquainted with Bokum Boring and Internal Threading Tools.

Ask for catalog N-1139 for High Speed Steels — Catalog N-398 for Carbide Tipped.

BOKUM TOOL CO.
14775 WILDEMERE AVE. · DETROIT 21, MICH.
SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

No SWAGING STRESSES . . . IN THIS LONG-LASTING MARKING TYPE

Pryor Interchangeable Steel Marking Type is engraved—not swaged—on modern, three-dimensional pantographs to avoid unnecessary stresses and strains.

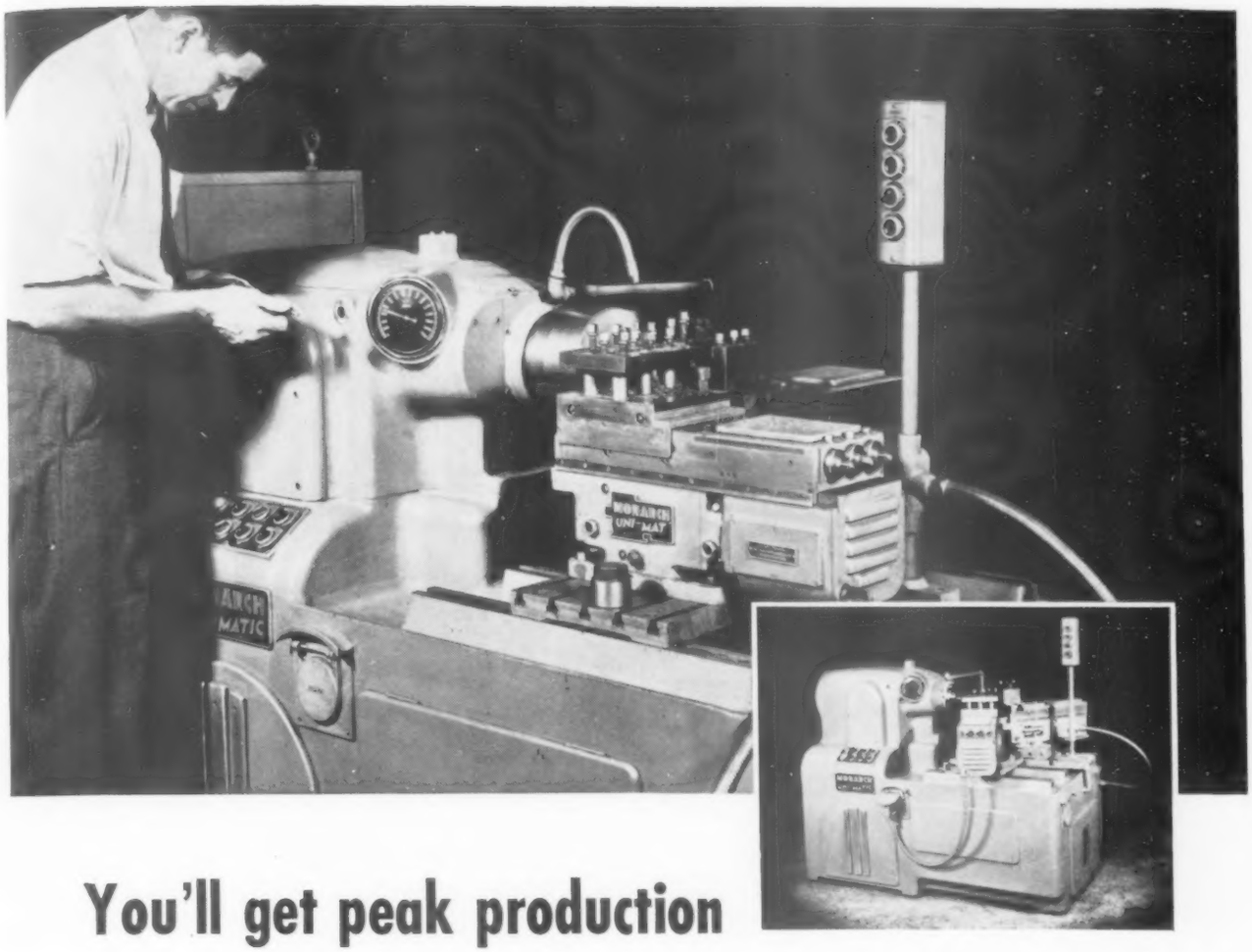
The fine Sheffield alloy tool steel from which Pryor Type is made is carefully tested in Pryor laboratories for flaws and impurities. Each individual piece of type is Rockwell hardness-tested, too, after heat treatment.

Perfect alignment and uniform depth are assured by microscopic inspection for fine finish, good bevel and absolute centering of character.

For every precision marking job . . . for years of service, use Pryor Marking Type.

Write us today for specifications.

WM. A. FORCE & CO.
INCORPORATED
107 WORTH STREET, NEW YORK 13, N. Y.
3000 WEST CHICAGO AVENUE, CHICAGO 22, ILL.
682 MISSION STREET, SAN FRANCISCO 5, CAL.
Canadian Rep.: W. H. Harrison, Ste. Anne de Bellevue, Que.



You'll get peak production AT A PROFIT—with the *Uni-Matic**

Spindle speeds up to 5000 RPM. Completely automatic cycle, electronically controlled. Independent-motor-driven interchangeable tool slides ("Uni-Mats") you can position universally, tool universally.

These are just a hint of some of the revolutionary features you'll find in the Uni-Matic . . . for chucking and fixture work as small as 1″ and as large as 16″ diameter. It's the machine that brings automatic production within reach of every shop, no matter how large or how small the lots.

You'll get minimum machining costs as only you can with specialized automatic production. Best of all, when you change your design you don't change Uni-Matics. Just tailor the tooling to fit your new operation—it's only a few hours' job. The Uni-Matic is universally adaptable.

*** UNI-MATIC** — Add this new name to your metal-turning dictionary—you'll be hearing a lot of it—wherever rising production costs are a factor. The *Uni-Matic* is Monarch's answer to this problem in the field of chucking and fixture work. For between-centers work it's the *Mona-Matic;* for hand screw machine work, the *Speed-Matic.*

Get full details on these three new machines *now* — from your nearest Monarch representative — or write us direct.

The Monarch Machine Tool Co. • Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE

Monarch

TURNING MACHINES

EDWARD

Blake

COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.

If You Spend $250 a Year on Taps You Need a BLAKE TAP GRINDER

If your annual bill for taps is $250, you can't afford to be without a Blake Tap Grinder. This compact, inexpensive machine will keep your taps always sharp, while increasing their life five to ten times—insurance that production schedules won't lag for lack of keen-edged taps.

The Blake Tap Grinder is fast, accurate, simple to operate and versatile. Setup is easily accomplished in a few seconds—then you can grind *both the chamfer angle and relief—of all the lands—in one continuous operation.* Men or women, with no special skill, can sharpen right- or left-hand taps with 2, 3, 4, 5, 6, 8 or 10 flutes. Also countersinks, 3- and 4-flute drills and many other tools requiring relief on the point can be ground accurately and easily.

The Blake method offers a rapid, low-cost means of chamfer sharpening, a method that gains thousands of extra holes for every tap. You can't afford to waste another dollar waiting—for no production machine is better than the cutting edge of the tool it uses—*write today for complete details on the Blake Tap Grinder.*

Please send me Bulletin No. 544 which describes the Blake Tap Grinder in Detail. T.E.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Stampings

- **EXPERIENCE**
  Established 1913.
- **CAPACITY**
  47 presses—200 tons maximum on 36 x 50 bed—14" stroke.
- **SERVICES**
  Projection, spot and arc welding, shearing and slitting.
- **TOOLS, DIES**
  Large tool room. Modern equipment.
- **ENGINEERING**
  Skilled engineering and technical service.

Prompt Quotations

OK Machine Company

Division OK Stamping Corporation

2103 FAIRFIELD AVENUE, FORT WAYNE 6, INDIANA

Special Tools are Costly

Often the "special" metal cutting tool you require differs so little from a standard tool that it pays to check your **NATIONAL** catalog first. Whenever you can use a standard size tool, as listed in the catalog, you can reduce your cutting tool costs.

Whether you require standard or special sizes, you can be sure of getting the right tool for each metal cutting job when you specify **NATIONAL Tools.**

Call Your

DISTRIBUTOR!

Leading distributors in every section of the country have complete stocks of National Cutting Tools. Every National distributor has a factory trained man to serve you. Call your National distributor for cutting tools or any staple industrial product.

NATIONAL

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS
END MILLS

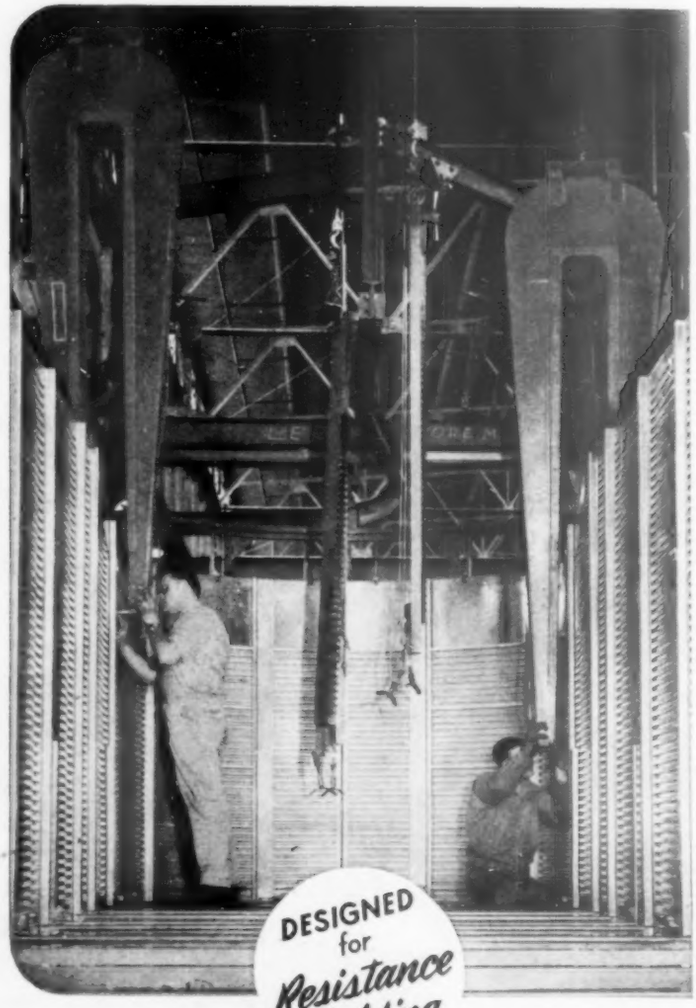
TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICH., U.S.A.

Tap and Die Division — Winter Bros. Co.

Factory Branches • New York • Chicago • Detroit • Cleveland • San Francisco • Distributors in Principal Cities

There really wasn't any other way to design them—



When Fruehauf designed its now famous stainless steel truck-trailer it went after real mass production: not just a couple of hand assembled trailers a day—but a complete trailer off the line every 45 minutes.

There were two ways to do a job like that. Either Fruehauf could build enormous plants with many assembly lines and use relatively slow equipment—or it could design the trailers for assembling by resistance welding from stem to stern, from roof to undercarriage.

Since the latter enabled Fruehauf to turn out highest quality trailers faster and at lower cost, there wasn't any real question in the end. Every one of these Fruehaufs rolling off the line is doing so through benefit of Progressive welding guns—push guns, scissors guns, C-type guns, little guns and big ones like those shown here.

Progressive's engineers will be glad to help you design your products so that they can be built better, faster and at lower cost with resistance welding.

IT PAYS TO WELD

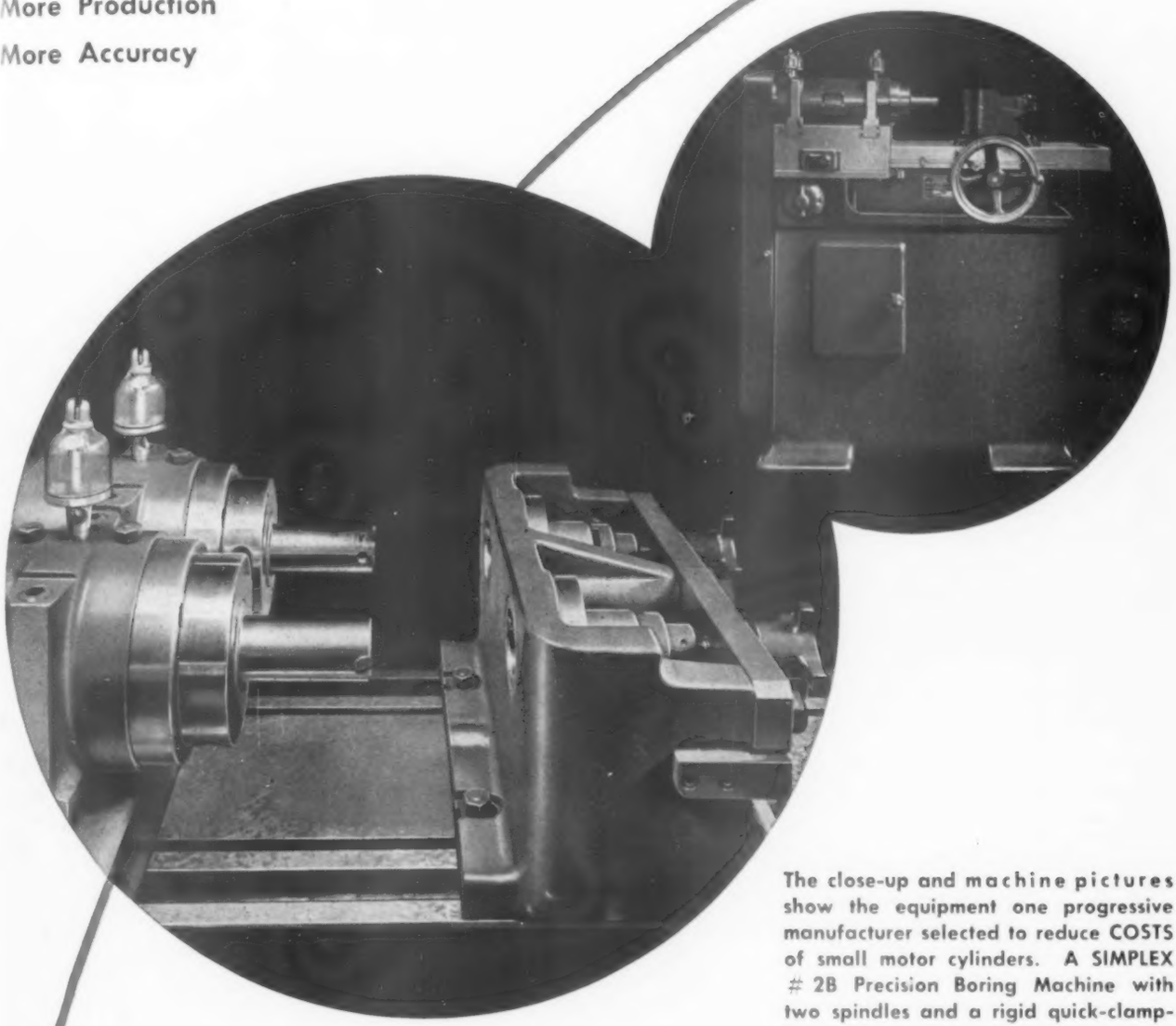
PROGRESSIVE Welder Co. 3050 E. OUTER DRIVE • DETROIT 12

RESISTANCE WELDING EQUIPMENT

SIMPLEX

ELEMENTS OF COST REDUCTION

Low Labor Cost
Low Tool Cost
Low Machine Cost
More Production
More Accuracy



The close-up and machine pictures show the equipment one progressive manufacturer selected to reduce COSTS of small motor cylinders. A SIMPLEX # 2B Precision Boring Machine with two spindles and a rigid quick-clamping fixture provide all the elements of cost reduction listed above.

Precision Boring Machines

STOKERUNIT CORPORATION
SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin
Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

A CENTERED EYE IN 1 OPERATION

Precision CENTERED EYE *Bending*

With DI-ACRO BENDERS

DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

DI-ACRO Bender No. 1

Forming radius 2" approx. Capacity $\frac{3}{16}$" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3 with larger capacities.

Send for CATALOG

"DIE-LESS" DUPLICATING showing many kinds of "Die-less" duplicating produced with DI-ACRO Benders, Brakes and Shears.

←Pronounced "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

375 EIGHTH AVE. SOUTH · MINNEAPOLIS 15, MINN.

M·B AIR-LINE FILTER and AUTOMATIC LUBRICATOR

Removes 96% to 97% of All Water, Dirt and Scale from Airline.

Air passes through a series of brass discs with .002 spacings, providing the finest degree of filtration obtainable by any known method. Then, as the air passes through head of Lubricator, oil is delivered into the purified airline in any desired volume. Write for Literature.

Representatives in Principal Cities

M·B PRODUCTS
130-134 E. Larned St.
Detroit 26, Michigan

Also

PNEUMATIC GRINDERS:

Model U.TR
60,000 RPM

●

Model S.S.-SR
100,000 RPM

●

Model W-SR
55,000 RPM

●

Model M-CR
75,000 RPM

●

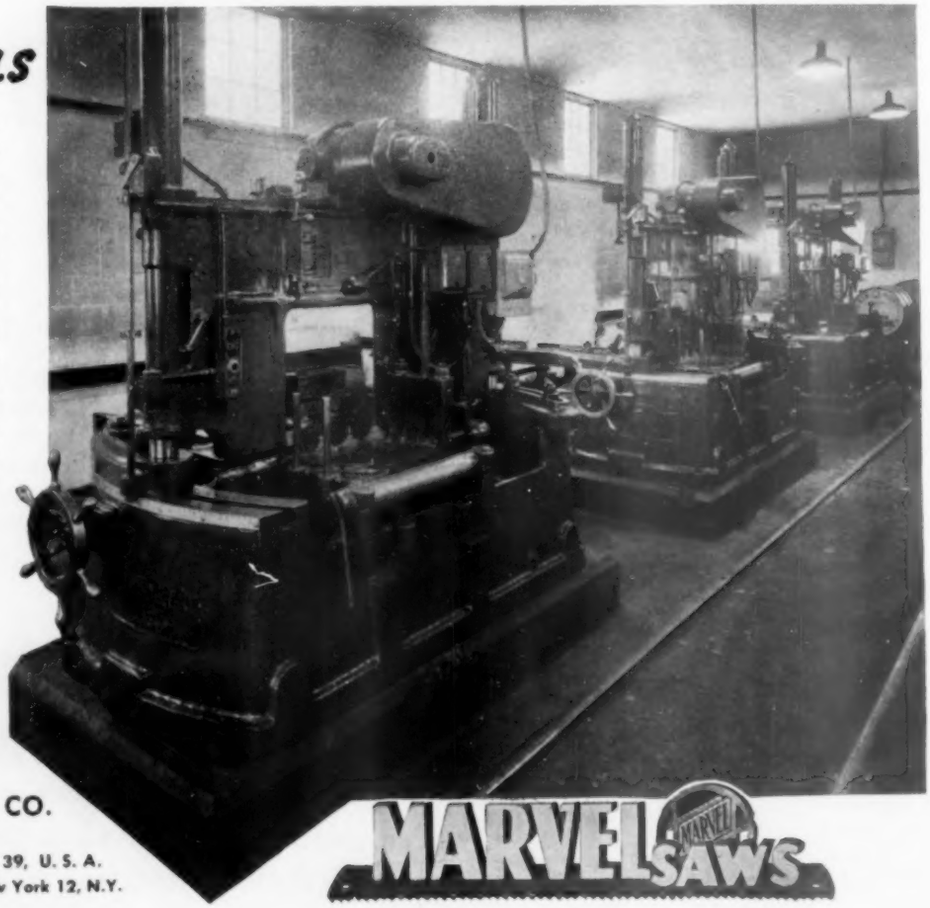
Model HD-CR
40,000 RPM

EASILY CUT-OFF TOUGHEST STEELS

Steels just don't come too tough for MARVEL Giant Hydraulic Hack Saws. Take for example, the three No. 18 MARVEL Saws, at the Babcock & Wilcox steel mill, shown above. These machines are used to cut test specimens from sample pieces of stainless and other tough alloy billets which are checked for seams, pipes, etc., before being drawn into tubing. It takes tough steel to make the best tubing, and it takes modern sawing equipment to cut it rapidly, accurately and economically.

With 10 types of metal-cutting saws, each available in a series of variations, MARVEL can furnish sawing machines that exactly meet your requirements. If you have a metal-sawing problem—call in the local MARVEL Sawing Engineer.

Write for MARVEL Catalog or check it in your Sweet's Catalog Files



ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE., CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N.Y.

MARVEL SAWS

Heat treat problems bothering you?

. . . call in a PARK Metallurgical Engineer

Park Chemical Company's representatives are familiar with all kinds of heat treating. When you are confronted with heat treating problems, consult our engineer in your territory or write us direct. A complete line of laboratory-controlled heat treating materials is available.

REPRESENTATIVES

A. A. Aponick
Phone: Wabash 1988
Cincinnati, Ohio

T. J. Clark
Phone: Pilgrim 6562
Philadelphia, Pa.

R. Hammerstein
Phone: 8-3926
East Lansing, Mich.

J. C. Thompson
Phone: Riverside 2360
Riverside, Ill.

W. P. Woodside, Jr.
Phone: Fairmont 0519
Cleveland, Ohio

Lombard Smith Company
Phone: Kimball 3297
Los Angeles, Calif.

Milton J. Vandenberg
Phone: Cedarcrest 7135
Chicago, Ill.

A. L. LaBounty
4915 Shackleford
Fort Worth, Texas

R. N. Lynch & F. W. Reiber
Phone: Tyler 6-8500
Detroit, Mich.

• Liquid and Solid Carburizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement.

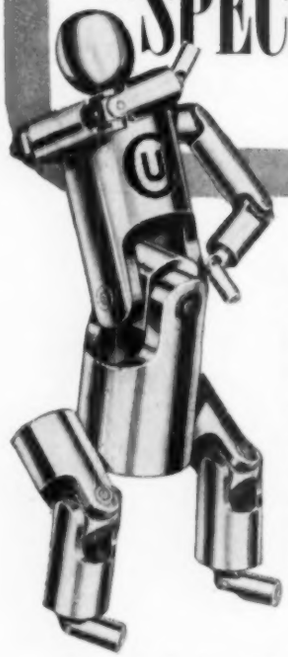
LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Weybridge Surrey, England

Park
CHEMICAL COMPANY
8074 Military Ave., Detroit 4, Mich.

we are

UNIVERSAL JOINT

"SPECIALISTS"



When you want the best — whether it's a small tool, a doctor, an electrician or design, etc. — you go to a specialist.

Curtis Universal Joint Company has pioneered in designing, improving and manufacturing industrial type universal joints EXCLUSIVELY for more than 20 years. We are *specialists.*

• • •

Whether it be universal joints for airplanes, machine tools, or special equipment and new applications, there is a Curtis Universal Joint that will meet or surpass every requirement for the job. If a Curtis Standard Joint, solid or bored, single or double, in sizes from $\frac{3}{8}$" to 4" O.D. does not meet your needs, we will design *and make* a joint that will.

Why not use this highly specialized knowledge and service — our engineers will gladly go over your problems with you.

Every joint made to CURTIS "STANDARDS" carries the Curtis Trademark — Look for it.

Specify

CURTIS

UNIVERSAL JOINTS

Write Dept. B-2

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

★ THE **HILLIARD**

Wherever extremely accurate control of intermittent machine operation is essential the Hilliard Single Revolution Clutch is unequalled. Its accuracy has won for it the acceptance of Industry for cutting, punching and packaging operations.

★ **WRITE TO-DAY!**

For the new series of 6 illustrated Bulletins furnished FREE upon request Featuring our complete line of Industrial Clutches and Couplings – Over-Running – Single Revolution – Friction –Centrifugal–Overload Release – Slip

★ **THE HILLIARD** *Corporation* ★

131 WEST 4TH ST ELMIRA, N. Y.

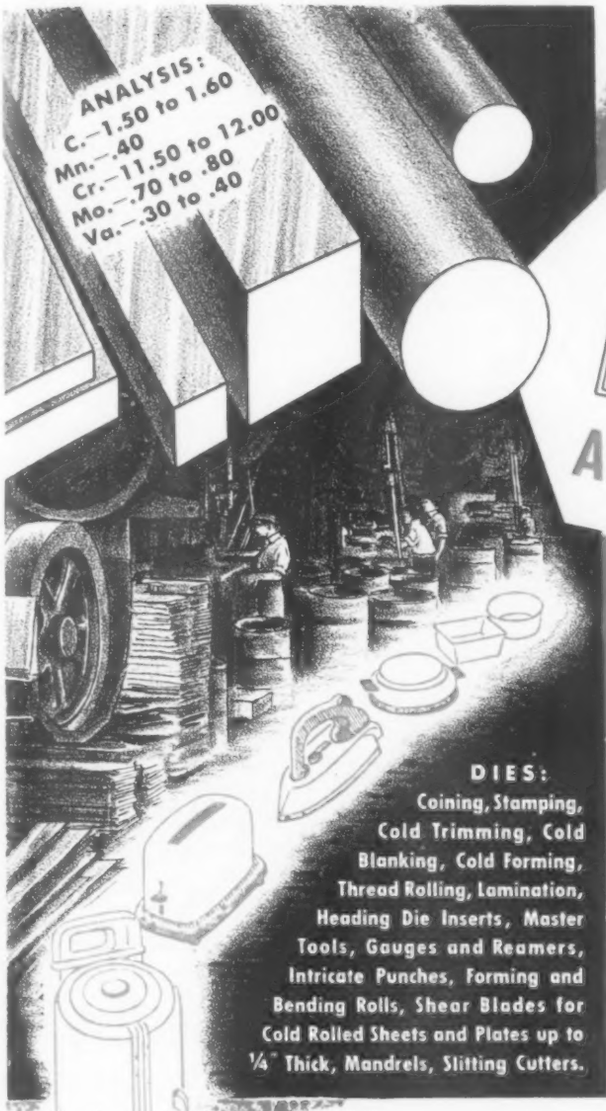
CENTRIFUGAL SLIP OVER-RUNNING FRICTION OVERLOAD RELEASE

● "Lundbye" flash-chrome surfaces by Racine are more wear-resistant due to the extreme hardness obtained (up to 1200 Brinell). Racine "Tri-Chrome" restores worn tools without regrinding or lapping. Salvages machine parts by controlled deposits of up to .001" thickness. Write today.

Racine Plating Company, Inc.

RACINE, WISCONSIN

HARD CHROMIUM, COPPER, NICKEL, BRIGHT CHROMIUM, CADMIUM, TIN PLATING • OXIDIZING • POLISHING • PICKLING


ANALYSIS:
C.—1.50 to 1.60
Mn.—.40
Cr.—11.50 to 12.00
Mo.—.70 to .80
Va.—.30 to .40
DIES:
Coining, Stamping, Cold Trimming, Cold Blanking, Cold Forming, Thread Rolling, Lamination, Heading Die Inserts, Master Tools, Gauges and Reamers, Intricate Punches, Forming and Bending Rolls, Shear Blades for Cold Rolled Sheets and Plates up to ¼" Thick, Mandrels, Slitting Cutters.

Peninsular's TRI-MO WHITE LABEL Air Hardening Tool Steel STAYS ON THE JOB Longer

When Tooling for Mass Production, Choose TRI-MO WHITE LABEL for Enduring Accuracy

Before tooling up for long run, precision jobs, consider the made-to-order advantages of Peninsular's TRI-MO White Label. Fundamentally, it is a superior air hardening steel, capable of Rockwell C 63 to 65 hardness, with remarkable resistance to abrasion and wear — an outstanding development of laboratory research in high carbon, high chromium steels. You get all the advantages of deep hardening penetration, with its non-sinking, non-deforming properties which permit numerous regrinds and continuous hard usage without loss of efficiency. Order TRI-MO White Label now from Peninsular's available supply. Write for our catalog!

SIZES NOW IN STOCK

Flats—¼ to 12 inches wide
Rounds—¼ to 10 inches in diameter
Squares—¼ to 4 inches
Forging Billets—4 to 10 inches square

The PENINSULAR STEEL Co.

CHerry 7173 2222 Lakeside Avenue, Cleveland 14 Emergency Phone—LAkewood 1133

WAREHOUSES

DAYTON 4: 401 Kiser St. TOLEDO 12: 25 Sylvania Ave. GRAND RAPIDS 7: 1590 Madison Ave., S. E.
DETROIT 7: 1040 McDougall Ave. AKRON 11: 915 Miami St. CHICAGO 12: 122 S. Damen Ave.

REPRESENTATIVES

ERIE: Industrial Metals & Products Co., 934 W. 9th St. ROCKFORD, ILL.: Rockford Industrial Supply Co.

Speed and Precision go hand in hand at Merz

If yours is a problem of obtaining high-precision fixtures or tools—*in minimum time*—here's news! MERZ produced these six intricate drill jigs for horizontal Natco set-ups—complete with patterns, equipment and castings—*in just 10 weeks.* What's more important, these jigs were built to the highest precision standards for drilling, reaming and counter-boring cylinder blocks and drilling and counter-boring an oil pan. This is a typical example of the fast, accurate work being done daily at MERZ *—where speed and precision go hand in hand.* MERZ designs and produces standard A.G.D. and special gages, tools, dies and experimental machines. Write for full information today.

WATCH FOR SPECIAL ANNOUNCEMENT SOON ON NEW MERZ AIR GAGES!

MERZ *Engineering Company*
INDIANAPOLIS 7, INDIANA

ARE YOU OVERLOOKING
Thread Rolling?

The process that excels in 6 ways!

- √ *Lower Cost*
- √ *Greater Accuracy*
- √ *Greater Uniformity*
- √ *Wider Versatility*
- √ *Smoother Finish*
- √ *Increased Strength*

Submit your threading problems to our engineers. Write for folder "Thread Rolling In Action."

ROLLED THREAD DIE COMPANY
Thread Rolling Dies and Machines
237 Chandler St., Worcester 2, Mass.

Making hardness testers is a full-time job...

"ROCKWELL" HARDNESS TESTER
Made Only by Wilson

Only Wilson makes the "ROCKWELL" Hardness Tester. And Wilson has made nothing but hardness testers for the past 25 years – has established "ROCKWELL" Hardness as the universally accepted standard.

ACCO

WILSON MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
373 CONCORD AVE., NEW YORK 54, N. Y.

ALL WRAPPED UP IN A SMOOTH, SEALED PACKAGE

THE POPE

6" x 18" SURFACE GRINDER SPINDLE

WITH G-E MOTOR *Sealed In*

Here's a streamlined Spindle that goes on the job and keeps on running at peak efficiency without attention.

Note particularly the *smooth, sleek* housing of the *sealed-in* motor — the result of *smooth* teamwork by POPE and GENERAL ELECTRIC engineers. This motor runs cool and delivers full 1 HP at the wheel.

You can see for yourself that there is no fan, no air passages, no openings of any kind. Dust and dirt are sealed out of both motor and bearings.

The lubrication is permanently sealed in — no time out for maintenance, no danger of running dry.

Pope Precision Spindles like this give you better final finishes.

Ask for Data Sheet No. 12.

No. 35

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET · HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

Fundamental...

to good gear cutting

TOUGH STEELS, deep cuts, high finish requirements characterize most gear cutting operations. Tearing, scuffing and metal pickup are often serious machining problems to makers of gears.

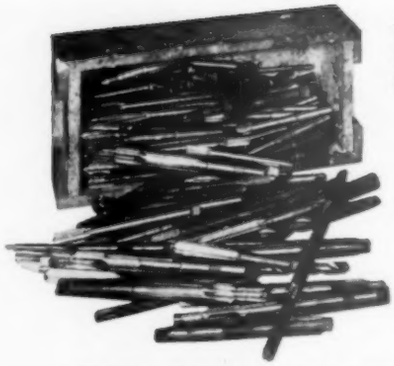
Wise gear manufacturers avoid these difficulties by specifying Stuart's high lubricity, high anti-weld type cutting oils for gear hobbing, shaping, generating, or finishing operations.

Stuart Cutting Oils and Stuart Engineering Service will help you produce better gears at lower cost.

Write for:
"Cutting Fluids for Better Machining"

D.A. Stuart Oil Co.
EST. 1865 LIMITED
2727-49 SOUTH TROY STREET, CHICAGO 23, ILL.

Stuart Oil Engineering Goes With Every Barrel



WRITE FOR OUR NEW CATALOG 46

DON'T SCRAP
WORN AND BROKEN CUTTERS

FOR 34 YEARS WE HAVE SPECIALIZED IN RESTORING DRILLS, REAMERS, COUNTERBORES, MILLING CUTTERS, ETC., TO NEW USEFULNESS

Let us help you reduce your cutting tool costs just as we have for hundreds of others

H. S. S. & TUNGSTEN CARBIDE

REPRESENTATIVES IN ALL INDUSTRIAL CENTERS

NATIONAL TOOL SALVAGE CO.

6511 EPWORTH BLVD. DETROIT 10, MICHIGAN

Rectangular Magnetic Chucks

IN A FULL RANGE OF SIZES FOR A WIDE RANGE OF JOBS

Brown & Sharpe Rectangular Permanent Magnet Chucks are economical, simple, and convenient for use on grinding machines, and for other light machine operations. These chucks use no electricity ... there are no installation, operating or maintenance costs. They do not heat under any conditions, and work can be held as long as desired. For details on the 5 sizes, write Brown & Sharpe Mfg. Co., Providence 1, R. I. B·S

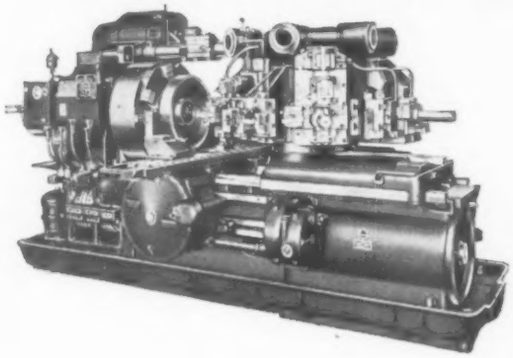
For sale only in the United States of America and its Territories

We urge buying through the Distributor

BROWN & SHARPE
PERMANENT MAGNET
CHUCKS

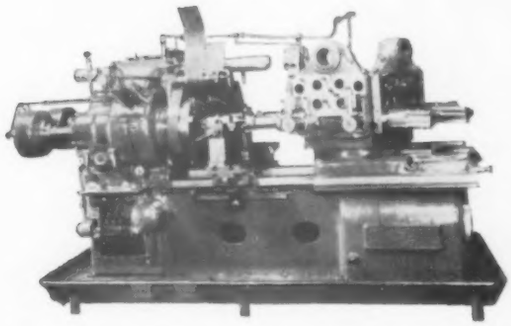
P&J AUTOMATIC CHUCKING *and* TURNING MACHINES

Leaders in their field for more than 40 years

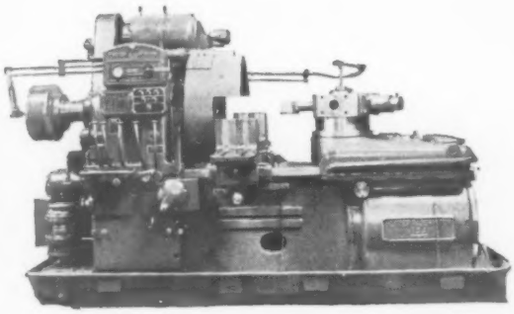


P&J 8DT and 8DXT Automatic

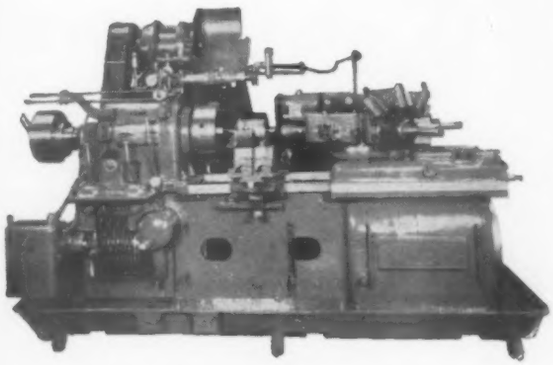
P&J 4D Automatic



P&J 5D Two Spindle Power-Flex Automatic



P&J 6D REL and 6D REELX Automatic



P&J 5D Power-Flex Automatic

BUY THOSE EXTRA VICTORY BONDS NOW!

The complete line of P&J Manufacturing Automatic Chucking and Turning Machines covers practically all requirements for size range of work. High accuracy, fast work and convenience in handling are assured whether parts produced are small or large. Every machine regardless of capacity, can be tooled and re-tooled to provide the utmost in flexibility for meeting specific machining requirements.

P&J engineers are available to help you with your production problems. Ask for descriptive literature covering P&J machines.

Authorized Agent, U. S. War Assets Corporation

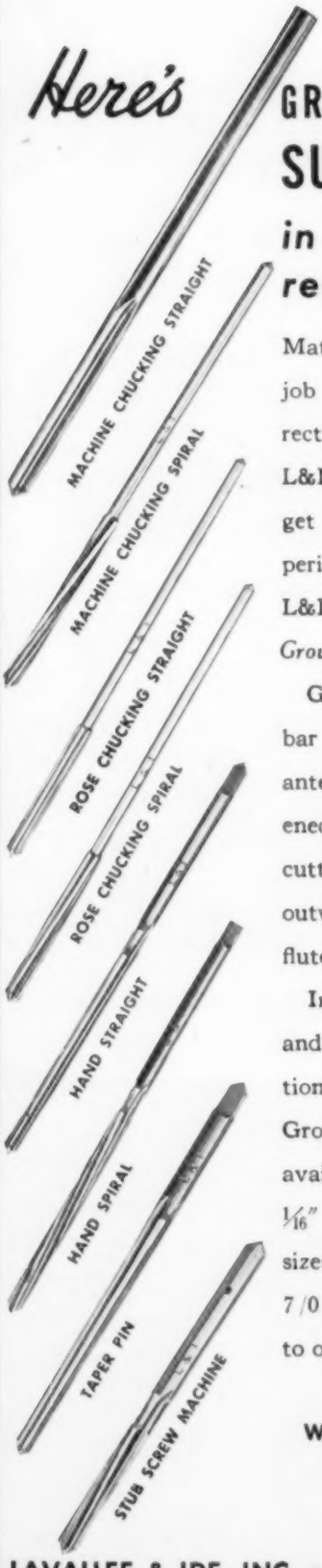
POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

Here's

GROUND FLUTE SUPERIORITY

in eight reamer types!



Match the reamer to the job by choosing the correct type from the new L&I line. Then you'll get the utmost in superior performance, for L&I Reamers are the *Ground Flute* reamers.

Grinding *after* the solid bar is heat-treated, guarantees a uniformly hardened tool with a sharper cutting edge that will far outwear ordinary milled-flute reamers.

Improve work quality and lower your production costs with L&I Ground Flute Reamers — available by 64's from 1/16" to 5/16", in wire gage sizes 1 to 60, tapers from 7/0 to #4, and specials to order.

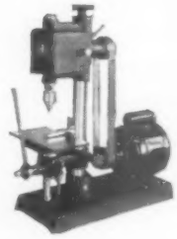
Write for Price List 46 today.

LAVALLEE & IDE, INC. • CHICOPEE, MASS.

L&I **GROUND FLUTE REAMERS**

Sensitive TAPPING

THE Hamilton Sensitive Tapping Machine is the sensible tool to install for the specialized tapping of tiny holes. It literally feels its way into center position while idling in reverse, and shifts its direction of rotation instantly and automatically when pressure is applied to the feeding lever. Release of pressure instantly reverses direction again and the tap is safely and speedily withdrawn. Blind holes may be threaded to the very bottom without danger of tap breakage.



Within its capacity (0 to 10-32 hole diameter) this machine will take all of the abuse that intensive production can inflict . . . and your work will still be accurate!

Write for illustrated literature containing specifications and prices. Do it now! You'll be glad you did. Address Department F.

THE *Hamilton* TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS

NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A

Is this *YOUR* coolant problem?

CASE HISTORY ·1

PROBLEM...
The coolant pump on a large gear cutter was not delivering coolant for a considerable interval after the machine was started. The result was that on close tolerance work there was a distinct chance of overheating and distortion.

SOLUTION...
A Ruthman Gusher Coolant Pump was installed on the gear cutter. It gave an instantaneous copious and dependable flow of coolant within split seconds of the start of the machine.

YOU CAN SOLVE IT WITH A

RUTHMAN GUSHER COOLANT PUMP

Model TL7380

There's a type and model of Ruthman Gusher Coolant pump to meet every need. Write now for Catalog 101

★ Names on request.

THE RUTHMAN MACHINERY CO.
1810 READING ROAD
CINCINNATI 2, OHIO
The "GUSHER"—A Modern Pump For Modern Machine Tools

SIMONDS Red Tang FILES

. . they keep your File-Costs down

RED TANG FILES have the same basic tooth-design as Simonds Metal-Cutting Saws. So Red Tangs *cut*, instead of *scrape* . . . remove more metal with less elbow-grease. That's why workers like them. *And here's why YOU will like them:* They last longer . . . and deliver more and better work per file-dollar. Order Simonds Red Tang Files from your Industrial Supply Distributor, or from the nearest Simonds office listed below.

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Avenue, Spokane 8, Washington; *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS Special Electric Furnace Steels

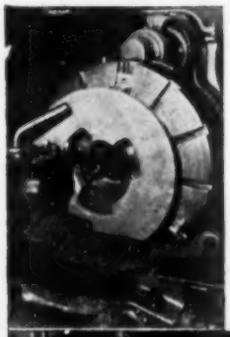
SIMONDS Grinding Wheels and Grains

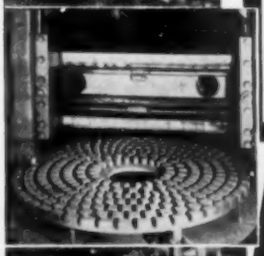
SIMONDS Simonds Products for Canada

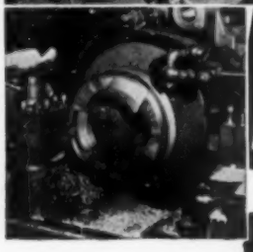
Scores of Tough Jobs Prove

KENNAMETAL K6 Machines CAST IRON *with Maximum Economy*

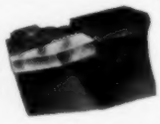
Kennametal Grade K6 is one of the most useful and needed recent developments in tool materials for machining cast iron and non-ferrous metals. It is an improved tungsten carbide having unusual strength in combination with exceptional abrasion-resistance and high hardness. The four performance studies outlined below are typical of scores of comparative service results that clearly show the superior properties of K6 for interrupted and continuous cutting on cast iron.







MULTIPLIES OUTPUT, ON FACING OPERATION, ON SANDY IRON CASTING



Replacing another make of carbide with a Style 11HD Tool having a clamped-on, advanceable K6 tip, made possible tripling the feed, doubling the cutting speed, and facing 8 times as many pieces per regrind. Operation—facing sandy iron castings. Feed—.036". Depth of cut—1/8" to 3/16". SFM-150 at start, 320 after tool entered cut.

REMOVES TONS OF METAL FROM CHILLED CAST IRON PARTS, AT TOOL COST OF 74 CENTS PER TON

Style 12 Tool with K6 tip turns 1⅛ lineal miles between grinds! Other makes of carbide failed at all speeds and feeds. After 10 regrinds K6 tip is used on lighter jobs. Operation—turning cast iron piston trunks, 21⅛" diameter, having six 3" or 4" ports (interrupted cut). Chilled around port holes. Very sandy surface. Feed—.09375". Depth of cut—⅛". SFM-120.

CUTS 35 PIECES (on Abrasive Electric Iron) AS AGAINST 3 FOR CARBIDE PREVIOUSLY USED

This unique tool, tipped with Kennametal K6, turns out 11⅔ times as much work between grinds as the carbide tool previously used. Operation—finish trepanning cut on electric iron part. Feed—.003". SFM-210. Accurate tolerances and good finish required, and produced.

TURNS OUT 10 TIMES AS MANY PIECES, ON ROUGH CASTING, BETWEEN REGRINDS

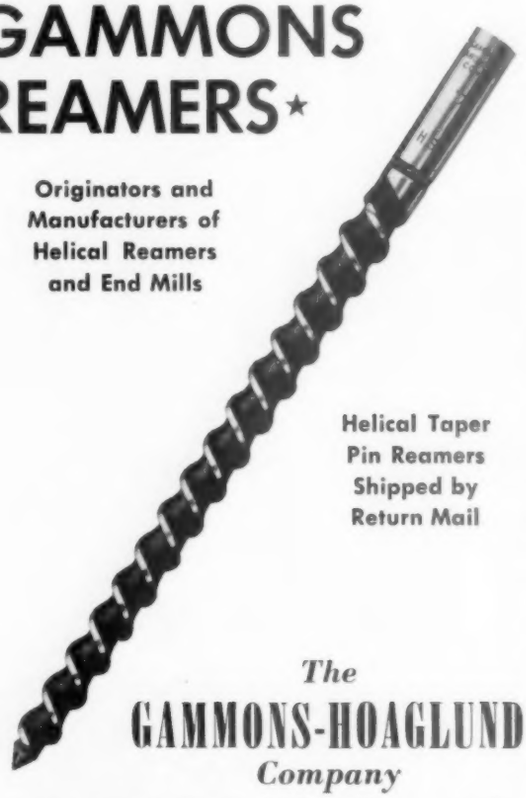
One to four pieces between grinds was the best performance recorded by other carbides on machining a webbed flange of inferior grade cast iron, having hard spots, and sand pockets. K6 turns out more than 40! Operation—turning outside diameter and facing both sides of hub and rim. Feed—.032". Depth of cut 1/16" to 3/8". SFM-280.

The best way to prove that K6 makes possible better, faster machining on cast iron, at lower tool costs, is to try it in your own shop—then compare tool performance and over-all costs. Order a few Kennametal blanks, or complete tools, now—and ask our district field engineer, who is fully acquainted with the properties of K6, to help you get maximum results from this *new* and *improved* tungsten carbide—Kennametal Grade K6.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL

GAMMONS REAMERS★

Originators and Manufacturers of Helical Reamers and End Mills



Helical Taper Pin Reamers Shipped by Return Mail

The
GAMMONS-HOAGLUND
Company

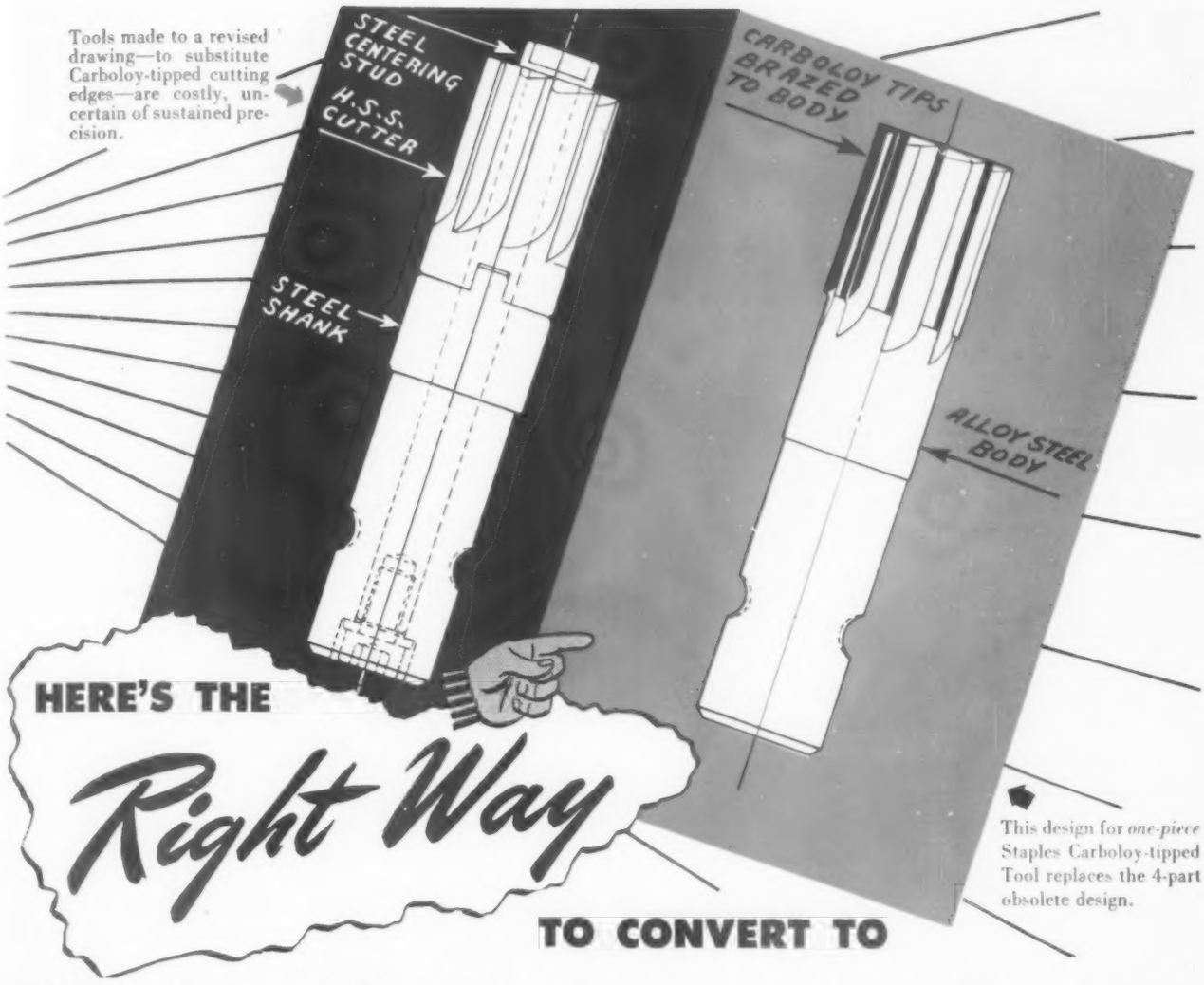
400 MAIN STREET, MANCHESTER, CONN.

Figures compiled from a recent questionnaire show that 77.9% of the TOOL ENGINEER readers either *purchase, specify* or *recommend* tools, machinery and allied products.

DIAMONDS FOR WHEEL DRESSING TOOLS
DIAMONDS FOR THREAD GRINDING TOOLS
DIAMONDS FOR ALL INDUSTRIAL PURPOSES

KOEBEL

Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13


Tools made to a revised drawing—to substitute Carboloy-tipped cutting edges—are costly, uncertain of sustained precision.
STEEL CENTERING STUD
H.S.S. CUTTER
STEEL SHANK
CARBOLOY TIPS BRAZED TO BODY
ALLOY STEEL BODY
This design for one-piece Staples Carboloy-tipped Tool replaces the 4-part obsolete design.
HERE'S THE
Right Way
TO CONVERT TO

CEMENTED CARBIDE CIRCULAR CUTTING TOOLS

YOU GO FAR TOWARD OFFSETTING TODAY'S HIGHER WAGES through the increased production you get with STAPLES Carboloy cemented carbide tipped circular cutting tools. Their extra-hard edges cut deeper, cleaner to closer tolerances, faster. They require fewer resharpenings.

When you convert from high speed steel—as many another manufacturer is doing these days—convert *all the way*. High speed steel tools with Carboloy tips applied to the shanks are less efficient, and cost more than specially designed or standard high precision StaplesTools.

Send us drawing of your high speed steel tool, and Staples engineers will submit drawing for complete new Staples Carboloy-tipped Tool, designed to take full advantage of cemented carbide superiorities.

Meet the challenge of increased wages with Staples Carboloy-tipped Tools. Mechanical science offers nothing finer.

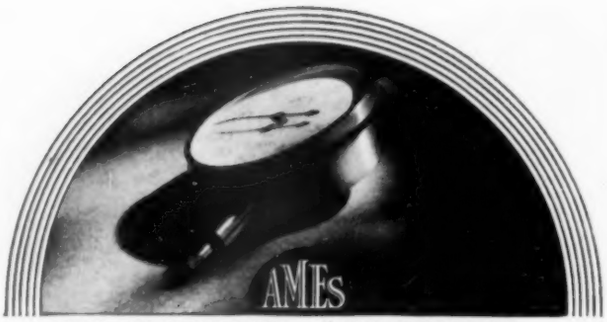
THE STAPLES TOOL COMPANY

Formerly Staples Tool & Engineering Company

CINCINNATI 25 **OHIO**

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS



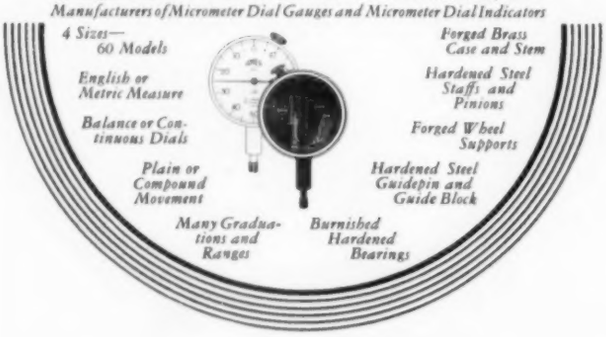
FOR MILLIONS of READINGS...

Insist on sensitivity, accuracy, and long life in Dial Indicators—the kind that AMES has been making for 50 years.

Many features of AMES design are exclusive. Only the best materials are used. Add expert craftsmanship and you have AMES Indicators that will outlast any you can buy—at any price. Send for illustrated Catalogue.

Representatives in principal cities B. C. AMES CO. *30 Ames Street Waltham 54, Mass.*

Manufacturers of Micrometer Dial Gauges and Micrometer Dial Indicators


4 Sizes— 60 Models
English or Metric Measure
Balance or Continuous Dials
Plain or Compound Movement
Many Graduations and Ranges
Burnished Hardened Bearings
Hardened Steel Guidepin and Guide Block
Forged Wheel Supports
Hardened Steel Staffs and Pinions
Forged Brass Case and Stem

TungTip

TOOLS

(ON THE TIP OF THE TONGUE)

PIONEER

IN THE ART OF MILLING WITH CARBIDES

PROMPT DELIVERIES • WRITE FOR CIRCULAR

TUNGTIP TOOLS DIV.
LOWELL & GRAYSON MFG. CO.

P. O. BOX 88
MONROVIA, CALIF.

P. O. BOX 1116
DETROIT 31, MICH.

BAY STATE

TAPS & DIES

Precise • Efficient • Economical
On Nearby Shelves of Industrial Supply Distributors

BAY STATE TAP & DIE CO.
Mansfield, Massachusetts

Improved TECO Cemented Carbide

New Highs in

—SPEEDS—FEEDS
—TOOL LIFE
—PRODUCTION

New Lows in

—DOWN TIME
—BREAKAGE
—TOOL COSTS

Tool-wise machinists have long known that Teco Cemented Carbide outproduces other carbides. Now—today's Improved Teco is better by a wide margin. It is even harder and tougher, with much greater resistance to wear and breakage. It outdoes itself in feeds, speeds and in work produced.

The reason is found in the new method of rigidly controlling all critical manufacturing processes, supervised by experienced carbide specialists. Proof? Just run it yourself. Replace your present carbide tools with Improved Teco Cemented Carbide, on any job you select. Check pieces produced—grinds per tool—tool life—machining cost. Improved Teco performance will amaze you.

Available in tools and blanks in all standard styles and sizes. Write now for catalog and prices.

Improved
TECO
CEMENTED CARBIDE

TUNGSTEN ELECTRIC CORPORATION
570 39th Street, UNION CITY, N. J.

Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representatives: Indianapolis, Ind., Chicago, Ill., Detroit, Mich.

- MORE PIECES BETWEEN GRINDS
- MORE GRINDS PER TOOL
- LESS DOWN TIME
- LOWER TOOL COST

DRILL JIG

BUSHINGS

All A.S.A. STANDARD types and sizes in stock for immediate delivery.

Excellent delivery on NEW GAGES and GAGES salvaged by HARD CHROMIUM PLATING.

Write today for particulars

ECONOMY TOOL & MACHINE CO.

MILWAUKEE 14, WISCONSIN

SENSATIONAL, NEW, EXPANDING MANDREL DESIGN...

OPERATION CYCLE SPEEDED—EXTRAORDINARY PRECISION!

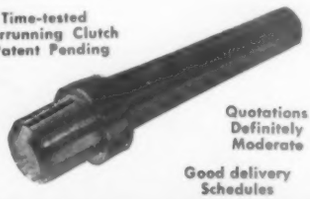
Curtiss-Wright Corporation ranks our product with *their* best tools. Cleveland Graphite Bronze Company, leading bearing manufacturer, states new high accuracy reached, plus substantial production boosts.

Young Roller Clutch Precision Mandrels

No more "C" washers, wrenches, drawbars, no more arcs or tapers before or after expansion grip — concentricity in low 10,000ths — production or inspection.

Assured parallelism of sleeve surface to center line—absolutely no variation in repeated mounting of parts—no tapers. Uniform full-work length friction-locking gives complete control and contact of entire bore surface area—Slip part on mandrel with slight counter-clockwise motion, that's all — it's ready — Self-contained, self-expansion, self-locking, self-contraction. Instant unloading, no jamming, no adjusting—Interchangeable sleeves—you do not obsolete Young Mandrels.—Built to your bore tolerance high limit, with automatic contraction to low limit—Any mounting—Any machine operation—For bore diameters .718 to 5.5—Reduces tool costs, extra equipment investment, operating costs, maintenance, down time, scrap, salvage.

Time-tested Overrunning Clutch —Patent Pending

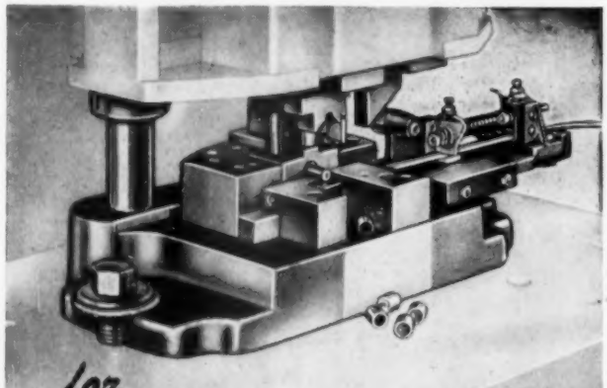


Quotations Definitely Moderate

Good delivery Schedules

YOUNG ARBOR CO., 3257 Bradford Rd.

CLEVELAND HEIGHTS 18, OHIO



for

PEACETIME PROFITS

With Dickerman Hitch Feeds for your punch presses, you'll get top production at rock bottom cost. They are accurate, reliable and easily changed from one die to another. Send now for descriptive booklet.

DICKERMAN HITCH FEEDS

MANUFACTURED BY

H. E. DICKERMAN MFG. CO.

321E Albany St., Springfield 9, Mass.

Eliminate Rejections IN TAPPING AND REAMING!

You'll be surprised at how the Ziegler Floating Holder overcomes misalignment difficulties which result in spoilage losses due to oversize or bell-mouthed holes.

By compensating automatically for inaccuracies in alignment of the spindle with the work, the Ziegler Holder makes it possible to turn out a first class job even if the spindle is out of alignment as much as 1/32" in radius, or 1/16" in diameter.

Instead of charging off ruined parts day after day, why not get a Ziegler Holder and put an end to all such troubles?

W. M. ZIEGLER TOOL CO.

1930 Twelfth Street — Detroit 16, Mich.

WRITE FOR CATALOG

Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...

THE BIG THREE

QUALITY Precision Built
DIES · FIXTURES · JIGS · GAGES
are

1. Engineered for maximum production capacity
2. Built Right
3. Priced Right

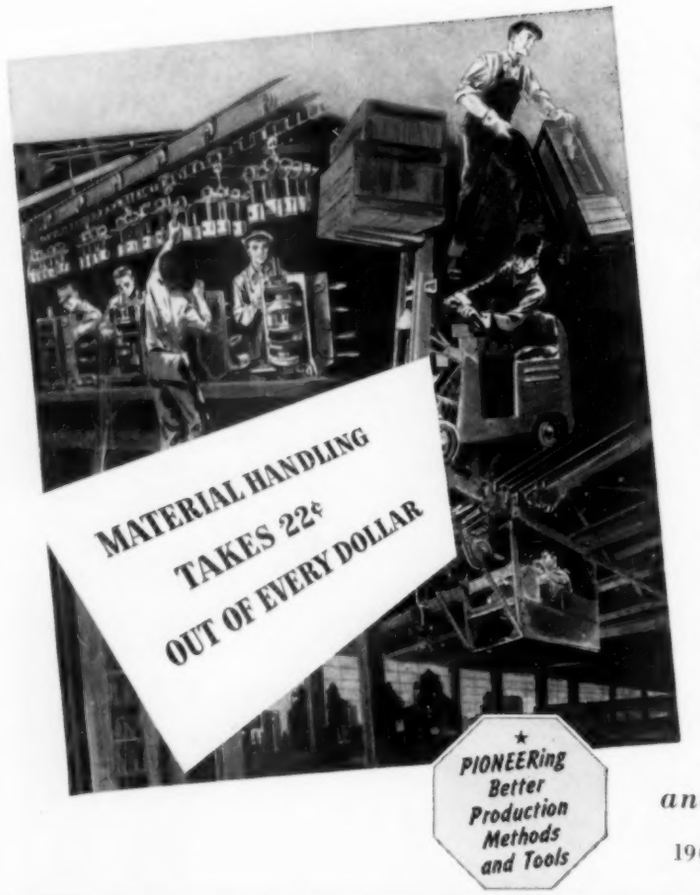
★ **THE BIG THREE** amount to a policy which we have maintained throughout 16 years of designing and building tools for industry.

If you are interested in tools that measure up to these standards, we will be glad to receive your inquiry.

QUALITY TOOL & DIE CO.

Manufacturers of "Quality" Products

401-15 NORTH NOBLE STREET, INDIANAPOLIS 2, INDIANA



An article in a recent magazine* makes the startling point that material handling takes 22 cents of every dollar spent for labor. And faulty material handling methods are often responsible for frequent shut-downs and excessive inventories with consequent increased costs.

We have solved material handling problems for a multitude of industries. They came to us for an unbiased opinion realizing we had no axe to grind—no particular system to sell. They could be sure that when our studies were completed and recommendations made, they were getting the one best system or combination of systems suited to their particular needs. *name on request

WRITE FOR THIS BROCHURE

"The Answers To Industry's Problems" is a new story of Pioneer's complete service to industry. It tells how Pioneer can help you with product design, quality control, time and motion study, production flow, production control, cost control, and production methods problems. Write for your copy of this interesting and informative booklet.

Pioneer Engineering
and Manufacturing Company
19645 JOHN R ST., DETROIT 3, MICHIGAN

Mac-it ALLOY STEEL SCREWS

GREATER STRENGTH
where you want it, with
HOLLOW SET SCREWS!

Mac-it Hollow Set Screws will solve your toughest holding-down problems where flush surfaces, compact construction and a neat appearance are factors. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

DISTRIBUTED NATIONALLY BY
STRONG, CARLISLE & HAMMOND COMPANY
CLEVELAND 13, OHIO
MANUFACTURED BY
MAC-IT PARTS COMPANY LANCASTER, PA.

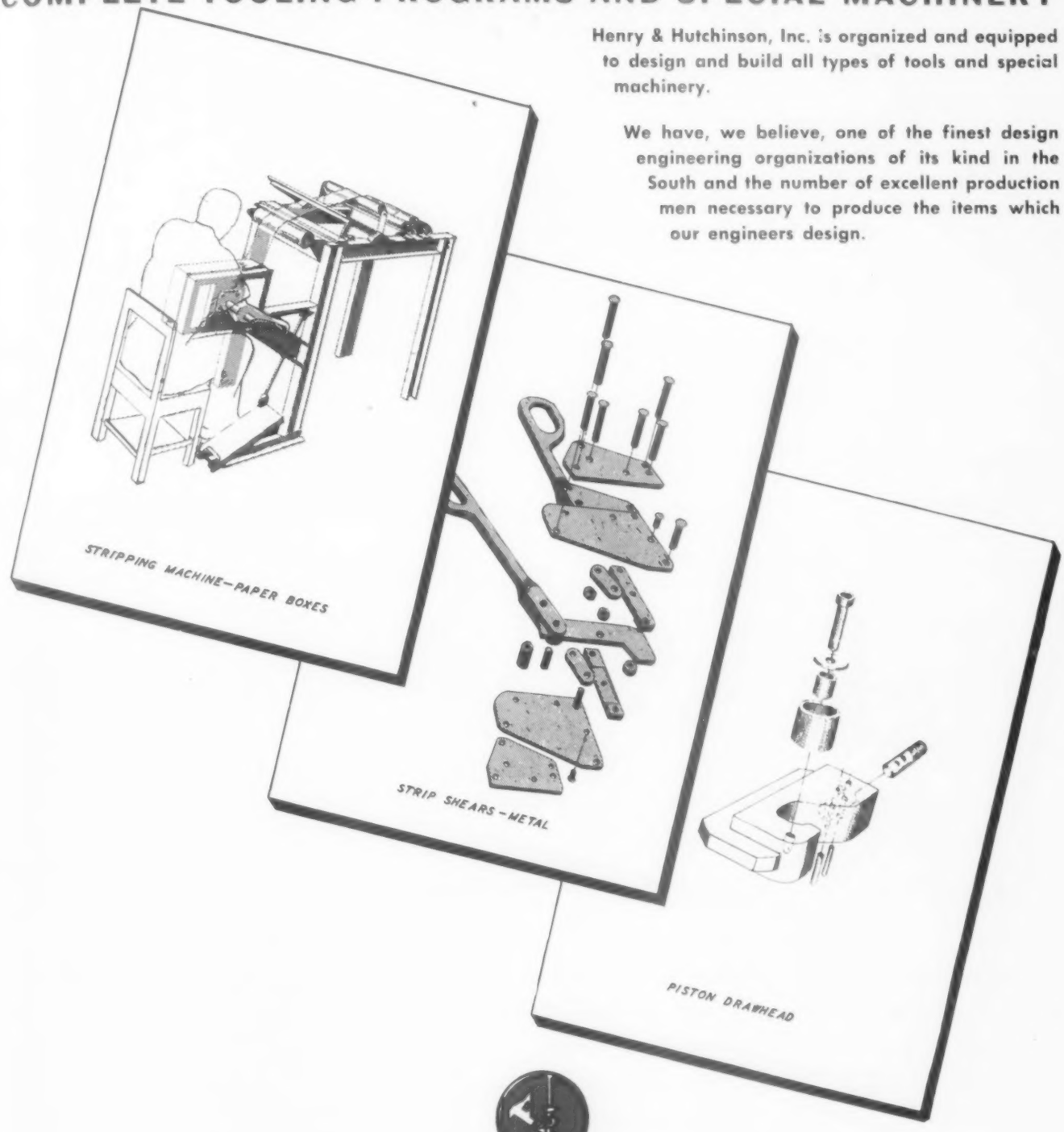
ENGINEERS DESIGNERS BUILDERS

OF

COMPLETE TOOLING PROGRAMS AND SPECIAL MACHINERY

Henry & Hutchinson, Inc. is organized and equipped to design and build all types of tools and special machinery.

We have, we believe, one of the finest design engineering organizations of its kind in the South and the number of excellent production men necessary to produce the items which our engineers design.



Production through Engineering

HENRY & HUTCHINSON, INC.

DECATUR (ATLANTA), GEORGIA

DEVELOPMENT ENGINEERS PRODUCTION ILLUSTRATORS PRODUCTION ENGINEERS

"THE NATIONALLY KNOWN

High Speed Steel"

Red Cut Superior

...FOR GOOD AND SUFFICIENT REASONS!

Maximum cutting ability is guaranteed by the balanced properties of high hardness, high edge strength, excellent toughness, wear resistance and uniformity of analysis and structure built into this steel. Easy to heat-treat without decarburization, too. **RED CUT SUPERIOR** has performed almost universal service throughout the metal working industry.

FIRST QUALITY TOOL STEELS

Vanadium-Alloys Steel Company

First Quality Tool Steels

Latrobe, Pennsylvania

COLONIAL STEEL DIVISION — ANCHOR DRAWN STEEL CO.

THERE ARE 7 FACTORS TO CONSIDER WHEN YOU BUY GAGES

1 . . DESIGN

Better design makes a gage easier and faster to use. VARD gages incorporate the best of the postwar gage design engineering.

2 . . MATERIAL

A well designed gage is a good buy when its basic material fully meets use requirements. VARD gages are made of Timken Graph-Mo steel, hard chrome plate or Norbide (Norton Company's boron carbide).

3 . . GRINDING

VARD gages are shaped on batteries of modern grinding machines — in temperature controlled rooms by expert gage-makers. Are ACCURATELY ground.

4 . . INSPECTION

Microscopic inspection equipment is necessary for gage testing. VARD owns visual and mechanical testing equipment of all types, reading to .000001-inch accuracy.

5 . . PACKAGING

A gage properly made must still be safely delivered into your hands. VARD gages are wrapped in shock-resisting packing and then sealed in individual boxes. Small gages are sealed in plastic tubes.

6 . . AVAILABILITY

VARD stocks most sizes of standard thread and dimensional gage. Our dealers also can supply you. Special gages are now produced in record time.

7 . . SERVICE GUARANTY

VARD guarantees its products against all defects of materials or workmanship. Moreover, VARD can rebuild or renew your worn gages.

Write for the VARD Gage Catalog — Ask for data on gages you need.

VARD INC.
Gagemakers

2981 EAST COLORADO STREET
PASADENA 8, CALIF., U.S.A.

Engineered for Greater Strength, Rigidity, Accuracy, Power and Endurance

Warco PRESSES

WELDED STEEL CONSTRUCTION
WELDMENTS... fully stress-relieved

Double Crank Gap Press

Warco double crank gap presses, with capacity range from 100 to 500 tons, permit easy handling of large diameter jobs and continuous work with wide strip stock. Welded steel frame, rigidly reinforced at the gap, virtually eliminates "spring action" at the opening, even under capacity loads.

How Added Life Is Built Into Warco Presses

Facilities equalled by few heavy fabricating plants in the world, plus the experience of skilled craftsmen, assure the finest weldments possible in Warco press frames and other welded parts. Further, Warco anneals all weldments to prevent locked up stress that could, as in the case of frames, lead to misalignment from overload.

In many other ways Warco designers have built added years of satisfactory service into Warco welded steel presses. Welded steel construction provides superior rigidity, strength, accuracy, and endurance.

Warco is prepared to handle your inquiry promptly. Consult us today, and when in Warren, be sure to visit our modern and complete factory, the largest of its kind in existence.

WARREN CITY MANUFACTURING COMPANY
1960 Griswold Street, Warren, Ohio
A subsidiary of
The Federal Machine and Welder Company • Offices in Principal Cities

ADVANTAGES WORTH CONSIDERING

All Models Electrically Controlled
Solid Frame
Friction Clutch and Brake Unit on All Models
Standardized Replacement Parts

ECCENTRIC GEAR PRESSES • TOOL PRESSES
HYDRAULIC PRESSES • PRESS BRAKES

Ever Hear of "Smear Metal"?

● You'll find it where you might least expect—on bearing surfaces finished by grinding. It's caused by the speed and pressure of grinding wheels which produce enough friction to tear away metal in the form of sparks. It creates a momentary high temperature which causes a metallurgical change in the surface layer of the metal. The average mechanic refers to this as annealing, and in severe cases, "burning." In *Superfinishing,* we call it "smear metal" because this defective layer comes off during the "wearing in" period and damages the bearing surface.

How *Superfinishing* Eliminates It

In *Superfinishing,* this faulty layer is removed by the mild scrubbing action of a fine abrasive as the part is rotated. A lubricant is applied, not for the removal of heat, as very little is generated, but to wash away abraded particles of metal and stone and control the cutting action. The working face of the stone, curved to the same radius of the surface being *Superfinished,* not only eliminates the "smear metal," leaving a clean bearing surface, but also produces a more perfect geometrical form. Without defects to penetrate the oil film or abrade mating surfaces, the life of such a *Superfinished* bearing is unlimited.

Complete information on *Superfinishing* is yours for the asking.

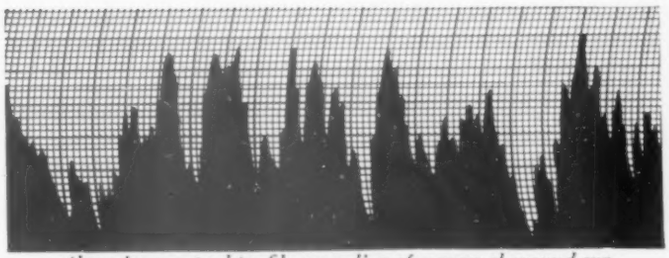
GISHOLT MACHINE COMPANY
1257 *East Washington Avenue* • *Madison 3, Wisconsin*

GISHOLT

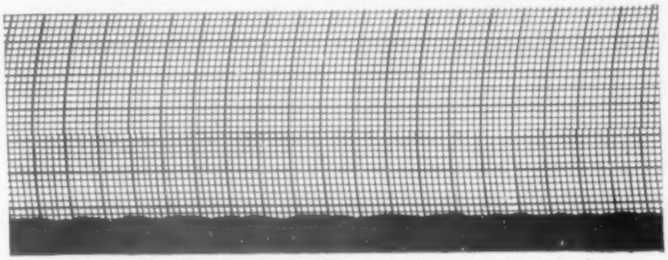
Look Ahead

Keep Ahead

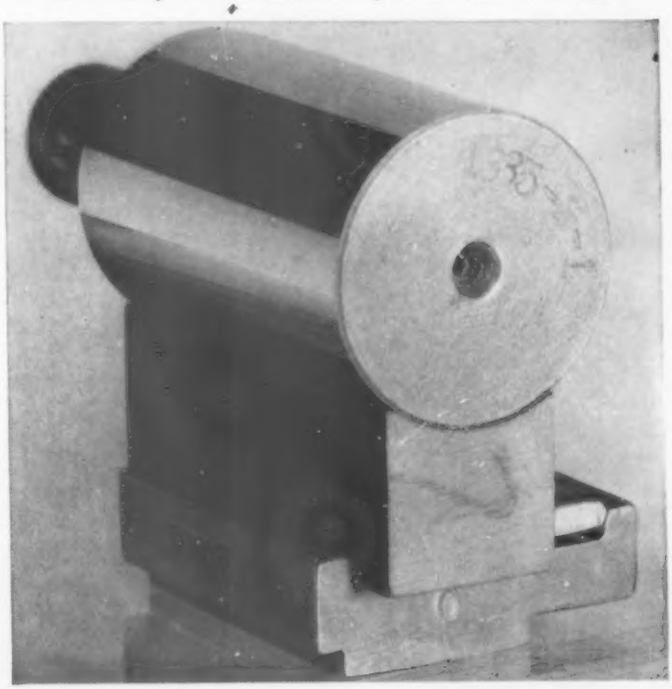
with Gisholt



Above is an actual profile recording of a normal ground surface as shown by the Brush Surface Analyzer. Surface roughness is 20 micro-inches. R. M. S.

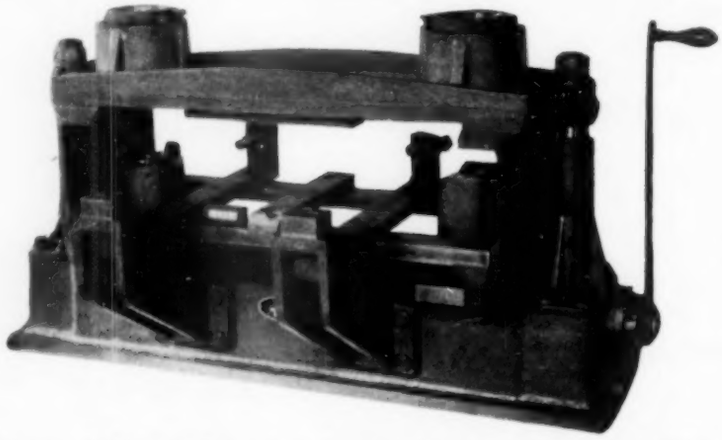


Superfinished surface finished to a smoothness of 3 micro-inches, R. M. S. Profile is exact Brush Surface Analyzer recording.



A Superfinished stud and the stone with which the operation is performed. The stone wears to conform to the average radius of the part, then acts as a master *surface to eliminate waviness.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



A LARGE CASTING IS HANDLED WITH EASE ON A STANDARD JIG

A larger L H type fixture is equipped with elevator attached to head. The part is pushed in on rails to the approximate stops. The downward motion of head drops the part on cup locators for machining the large boss holes. Upward motion of head lifts casting from the locators.

MORE PRODUCTION WITH LESS OPERATOR FATIGUE

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Avenue — **ASK FOR CATALOG 941** — **Detroit 27, Michigan**

Represented by

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Houston—Engineering Sales Co.
Chicago—Ernie Johnson

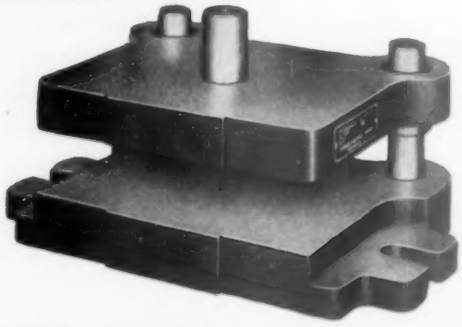
Canada—Hi-Speed Tools, Ltd., Galt, Ont.
Boston—A. R. Shevlin Co.
Oneida, N. Y.—W. F. Himmelsbach

Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.
Los Angeles—Engineering Sales Co.

"Standard"

PRESSES AND ACCESSORIES

ALL-STEEL DIE SETS



Keep your dies set up in "Standard" All-Steel Die Sets ready for instant use. Made with the same high precision as "Standard" Power Presses. Fully interchangeable parts; complete range of sizes. Ask for new Steel Die Set catalog just off the press.

MODEL 3T POWER PRESS

"Standard" Model 3T is a popular, efficient power press for set-ups as large as 8" x 11½". Fitted with an improved roller type clutch; adjustable for single stroke or continuous operation. The clamp type punch holder speeds the handling of die sets. Model 3T is complete with geared head motor and has many features for safety and convenience, including two-hand safety trip and inclinable frame. "Standard" Roll Feed and Dial Feed Accessories available. Write for new Bulletin 3T.

STANDARD MACHINERY CO.
1585 ELMWOOD AVENUE, PROVIDENCE 7, R. I.

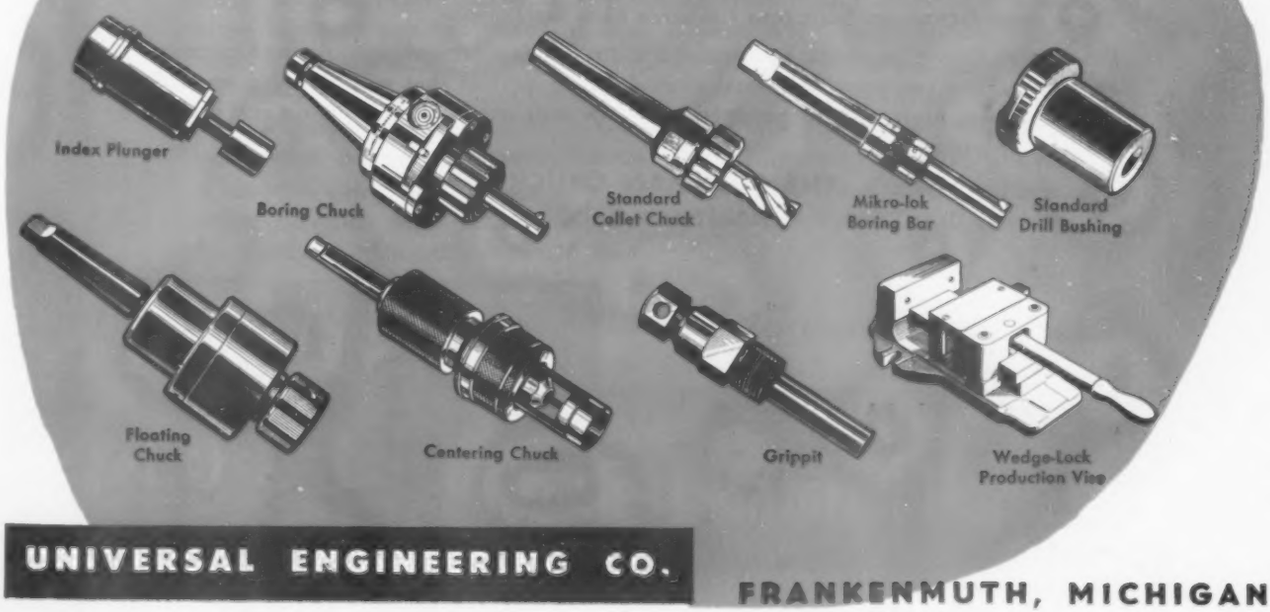
Universal Boring Chuck

RIGID, CONVENIENT, PRECISION PERFORMANCE ON MILLING MACHINES, BORING MILLS, TURRET LATHES

Here's the outstanding tool of its type on the market—one that will greatly simplify your boring operations. The Universal Boring Chuck holds bars firm and rigid in boring mills and milling machines, and is ideal for lathe use in drilling and turning eccentric parts. Special construction permits the bar to be advanced or receded to suit the work, speeding production. Feed screw dial can be adjusted to zero setting in any position in feed range, and anti-backlash screw assures .0005" accuracy in setting. Offset slide lock holds location after feed adjustment has been made. Available in straight or taper shank to accommodate bars from ⅜" to 1". For easier—faster—and more accurate boring, it will pay you to standardize with Universal Boring Chucks. Write for complete information.

Special! Centering button, mounted in slide and ground at same time as flat on side of chuck, provides reference point for returning collet on center. Thus, centering and drilling and other operations can precede boring in same set-up.

UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND EFFICIENCY IN YOUR PLANT.



UNIVERSAL ENGINEERING CO. FRANKENMUTH, MICHIGAN

• POWER
• PRECISION
• SPEED

GOOD CHUCKS

ARE ESSENTIAL TO LOW COST PRODUCTION

POWER to take fast, heavy cuts...to turn a hot chip that makes the coolant smoke...

PRECISION that holds each one of a million work-pieces in exactly the same relation to the tool...and cuts down your percentage of rejects...

SPEED that gets a finished work-piece *out* of the chuck and a rough one *in*, in a matter of seconds...

These three factors are built into Cushman Chucks.

Before you decide on chuck equipment for those new machines, consult the Cushman engineers; they can provide special work-holding devices that will help you toward high accuracy, high volume production at low unit costs. Consult us on any work-holding problem.

THE CUSHMAN CHUCK CO.
HARTFORD 2, CONN.

A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS

NORBIDE* INSERT IN ANVIL

Eliminates Necessity for Lapping

Buyers and users of visual gages will be interested in this application of a wear-resistant NORBIDE piece. A flat, molded NORBIDE piece has been inserted in the anvil at a point where the greatest wear will occur. Field reports indicate that many NORBIDE inserts have been in constant use for over a year with no attention having been given them, other than for inspection. Less wear-resistant anvils, on the other hand, usually have to be frequently relapped to be kept in condition. NORBIDE is the trade-mark for Norton Boron Carbide—the hardest material made for commercial use. It has had wide and successful use as wear-resistant parts for a variety of measuring devices. Ask your regular supplier about NORBIDE gages or for further information write to:

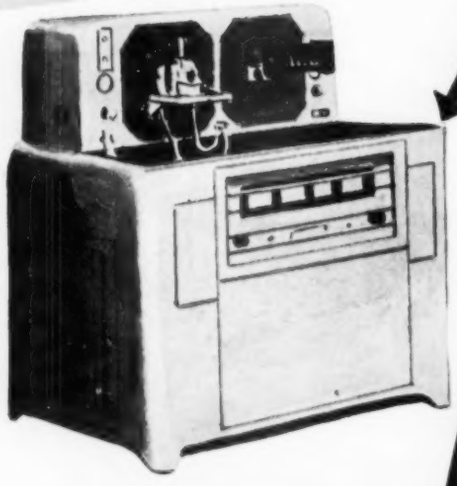
NORTON COMPANY — Worcester 6, Mass.

NORBIDE* – The Hardest Material Made by Man

NORTON BORON CARBIDE

* *Trade-mark Reg. U. S. Pat. Off*

GOVERNMENT-OWNED SURPLUS
AMERICA'S BIGGEST POST-WAR ASSET



Modernize

PRODUCTION HARDENING

with Surplus

INDUCTION EQUIPMENT

If your production calls for the hardening, brazing, annealing or heating of metal parts here is the opportunity of a lifetime. A large quantity of Tocco induction heating equipment is available as surplus—for immediate disposal. The equipment is both used and unused and is price-tagged to sell quickly.

Here are the

SPECIFICATIONS

TOCCO EQUIPMENT

9600 cycles; 1, 2, or 3 Station 220/440 volt, 3-phase, 60 cycle, range 7½ to 125 KW; and 200 KW machines at 3000 cycles.

GET THE FACTS

To War Assets Administration: Without obligation, please send me information on the cost and location of Induction Heating Equipment of the following type.

_____

_____

Name_____ Tel. No._____

Firm_____

Address_____

City_____ State_____

EXPORTERS

Most surplus property is available to the export market. Merchandise in short supply is withheld from export, and if such items appear in this advertisement they will be so identified by an asterisk.

Although this material has been previously offered to priority claimants, 10% of the merchandise has been reserved to fulfill any further needs of priority claimants including VETERANS OF WORLD WAR II who are invited to contact the Regional Office serving their area.

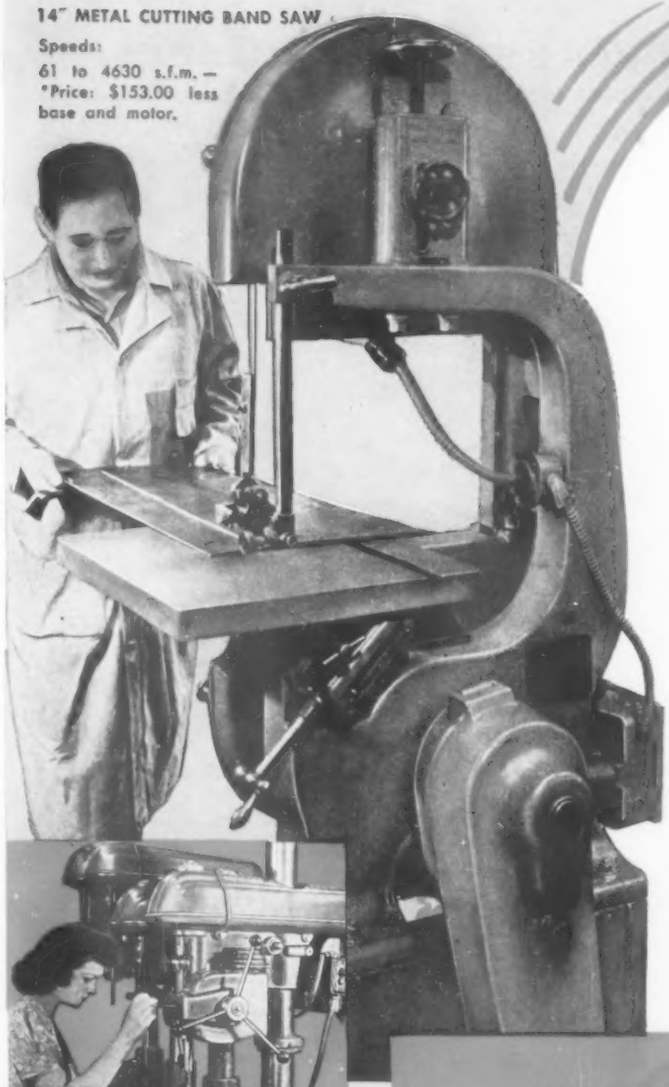
WAR ASSETS ADMINISTRATION

GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane

700-1

14" METAL CUTTING BAND SAW
Speeds:
61 to 4630 s.f.m. —
*Price: $153.00 less base and motor.



20" 4-spindle, power feed Drill Press. Spindle travel 6". Speeds: 260 to 2600 R.P.M. with standard motors. 85 R.P.M. with special gear reduced motor. *Price: $1314.00 less motor. Available with 1 to 6 spindles, hand or power feed.

RADIAL CUT-OFF MACHINE
21½" ram travel. *Price: $446.00 with 2 or 3 h.p. geared motor, less base.

"Paid in Full"

Each of the Walker-Turner Machines shown on this page has long since "paid in full" its low initial cost in savings due to its increased production over the heavier and less flexible tools which they replaced.

In fact, the investment is so low that it is profitable to employ them as part time workers on jobs that were not completely mechanized before.

Used by the thousands on 24-hour day schedules for volume production during the past ten years, they are now being purchased to tool up for low costs in the competitive markets to come.

Plan your operations to speed up production in many directions with Walker-Turner Machine Tools—and use the guidance of your nearest Walker-Turner Distributor in helping you with the know-how.

23

*F.O.B. Plainfield—slightly higher west of the Rockies and in Canada

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

walker-Turner
COMPANY, Inc.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS • RADIAL SAWS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Index of Tool Engineer Advertisers

September, *1946*

A

Abrasive Machine Tool Co. 120
Hammond-Goff Co.
Acme Industrial Co. 115
Edward C. Kennedy
Acme Tool Co. 122
Diener & Dorskind, Inc.
Allegheny Ludlum Steel Corp. 81
Walker & Downing
Allen Mfg. Co. 124
Norris L. Bull Advertising
Allied Products Corp. 120
Charles M. Gray & Assoc.
B. C. Ames Co. 142
Badger & Browning, Inc.
Armstrong-Blum Mfg. Co. 130
Ross Llewellyn Advertising
Armstrong Bros. Tool Co. 122
Ross Llewellyn Advertising
Aro Equipment Corp. 83
Beeson-Faller-Reichert, Inc.

B

Baker Bros., Inc. 87
Bay State Tap & Die Co. 142
Hammond-Goff Co.
Charles H. Besly & Co. 91
Evans Assoc., Inc.
Bethlehem Steel Co. 82
Jones & Brakeley, Inc.
Edward Blake Co. 126
Henry A. Loudon Advertising
Bokum Tool Co. 124
Charles M. Gray & Assoc.
Brown & Sharpe Mfg. Co. 120 & 136
Horton-Noyes Co.
Bryant Chucking Grinder Co. 85
Henry A. Loudon Advertising

C

Cal-Cutter Co. 16
Wolfe, Jickling, Dow & Conkey, Inc.
Carborundum Co. 84
Addison Vars Co.
Cleveland Twist Drill Co. 95
Belden & Hickox
Colonial Broach Co. 111
Denham & Co.
Columbia Tool Steel Co. 122
Continental Tool Works
Div. of Ex-Cell-O Corp. 159
Holden-Clifford-Flint, Inc.
Cosa Corp. 99
The Cross Co. 12
McLain Organization
Curtis Universal Joint Co. 132
duPont & Cahalin, Inc.
Cushman Chuck Co. 154
Edward W. Robotham & Co.

D

Danly Machine Specialties, Inc. 103
Behel & Waldie & Briggs, Inc.
Defiance Machine Works, Inc. 107
Beeson-Faller-Reichert, Inc.
Delta Mfg. Co. 110
Hoffman & York
Detroit Reamer & Tool Co. 117
Dudgeon, Taylor & Bruske, Inc.
Detroit Tap & Tool Co. 119
Denham & Co.
H. E. Dickerman Mfg. Co. 144
DoALL Co. 89
Weston-Barnett, Inc.
Dumore Co. 118
Behel & Waldie & Briggs, Inc.

E

Economy Tool & Machine Co. 144
Electrol, Inc. 86
Victor A. Smith Advertising

F

Federal Products Corp. 2
Wm. A. Force & Co., Inc. 124
Wendell P. Colton Co.

G

Gairing Tool Co. 13
R. Marshall Advertising
Gallmeyer & Livingston Co. 88
Wesley Aves & Assoc.
Gammons-Hoaglund Co. 140
Gerotor May Corp. 90
S. A. Levyne Co.

G

Giddings & Lewis Machine
Tool Co. 6 & 7
Cramer-Krasselt Co.
Gisholt Machine Co. 80 & 151
Buchen Co.
Grob Bros. 126

H

Hamilton Tool Co. 138
Clinton B. Leap Advertising
Hammond Machinery Builders, Inc. 115
Crescent Advertising Serv.
Hanchett Mfg. Co. 92
Paxson Advertising
Hannifin Mfg. Co. 93
Edwin H. Verrall
Hardinge Bros., Inc. 3
Taylor Ward, Inc.
Heald Machine Co. 116
Rickard & Co.
Henry & Hutchinson, Inc. 147
Hilliard Corp. 132
Taylor Ward, Inc.
Holo-Krome Screw Corp. 160
R. H. Young & Assoc.

I

Ingersoll Milling Machine Co. 113
Cummings-Brand & McPherson
International Nickel Co., Inc. 94
Marschalk & Pratt Co.

K

Kennametal, Inc. 140
W. S. Hill Co.
Koebel Diamond Tool Co. 140
Holden-Clifford-Flint, Inc.

L

Landis Machine Co. 79
Langsdale Advertising
Lavalle & Ide, Inc. 138
Wm. B. Remington, Inc.

M

M-B Products 130
Dudgeon, Taylor & Bruske, Inc.
Majestic Tool & Mfg. Co. 96
Merz Engineering Co. 134
Caldwell-Baker Co.
Metal Carbides Corp. 97
Meek & Thomas, Inc.
W. F. Meyers Co., Inc. 112
Caldwell-Baker Co.
Micromatic Hone Corp. 121
Witte & Burden
Midvale Co. 98
Lewis & Gilman
Monarch Machine Tool Co. 125
Fuller & Smith & Ross, Inc.
Morse Twist Drill Co. 10 & 11
Horton-Noyes Co.

N

National Automatic Tool Co., Inc. 123
National Broach & Machine Co. 114
Witte & Burden
National Tool Salvage Co. 136
Burke Bartlett Co.
National Twist Drill & Tool Co. 127
Holden-Clifford-Flint, Inc.
Nichols-Morris Corp. 102
Henry A. Loudon Advertising
Norton Co. 155
John W. Odlin & Co., Inc.

O

O. K. Machine Co. 126
Willis S. Martin Co.
Oilgear Co. 109
Kirkgasser-Drew
O'Neil-Irwin Mfg. Co. 130
Foulke Agency

P

Park Chemical Co. 131
Marvin Hahn Advertising
Peninsular Steel Co. 133
Brad-Wright-Smith Advertising, Inc.
Pioneer Engineering & Mfg. Co. 146
St. Claire Advertising
Pope Machinery Corp. 135
Walter B. Snow & Staff

P

Potter & Johnston Machine Co. 137
Pratt & Whitney II
Wm. B. Remington, Inc.
Progressive Welder Co. 128
Denham & Co.

Q

Quality Tool & Die Co. 145
Roger Beane Advertising

R

Racine Plating Co. 132
Western Advertising Agency
Rolled Thread Die Co. 134
Lewis Advertising Agency
Ruthman Machinery Co. 138
Bunker & Downing, Inc.

S

Screw Machine Tool Co. 108
St. Claire Advertising
Scully-Jones & Co. 106
Van Auken & Ragland
Sheffield Corp. III
Witte & Burden
Simonds Saw & Steel Co. 139
Sutherland-Abbott Advertising
South Bend Lathe Works 100
Lamport, Fox, Prell & Dolk, Inc.
Standard Gage Co., Inc. 5
Hevenor Advertising Agency, Inc.
Standard Machinery Co. 152
Hammond-Goff Co.
Staples Tool Co. 141
Keelor & Stites Co.
L. S. Starrett Co. 8
Walter B. Snow & Staff, Inc.
Steinle Machine Co. 14
Stokerunit Corp. 129
Strong, Carlisle & Hammond Co. 146
Fuller & Smith & Ross, Inc.
D. A. Stuart Oil Co. 136
Russell T. Gray, Inc.
Swartz Tool Products Co., Inc. 152

T

Thompson Grinder Co. 101
Kircher, Helton & Collett
Threadwell Tap & Die Co. 105
Walter B. Snow & Staff, Inc.
Tungsten Electric Corp. 143
Thoma & Gill
Tungtip Tools Div. 142
Lowell & Grayson Mfg. Co.

U

Universal Engineering Co. 153
Seemann & Peters, Inc.

V

Vanadium-Alloys Steel Co. 148
Walker & Downing
Vard, Inc. 149
Sylvester Industrial Advertising Agency
Vulcan Tool Co. 9
Chester C. Moreland Co.

W

Walker-Turner Co., Inc. 157
W. L. Towne Advertising
War Assets Administration 56 & 104
Fuller & Smith & Ross, Inc.
Warren City Mfg. Co. 150
McClure & Wilder, Inc.
S. B. Whistler & Sons 15
Addison Vars Co.
Wilson Mechanical Instrument
Co., Inc. 134
Reincke, Meyer & Finn, Inc.
Wood & Spencer Co. 115
Scheel Advertising Agency
N. A. Woodworth Co. IV
Brooke, Smith, French & Dorrance, Inc.
Wm. Wrigley, Jr., Co. 112
Ruthrauff & Ryan, Inc.

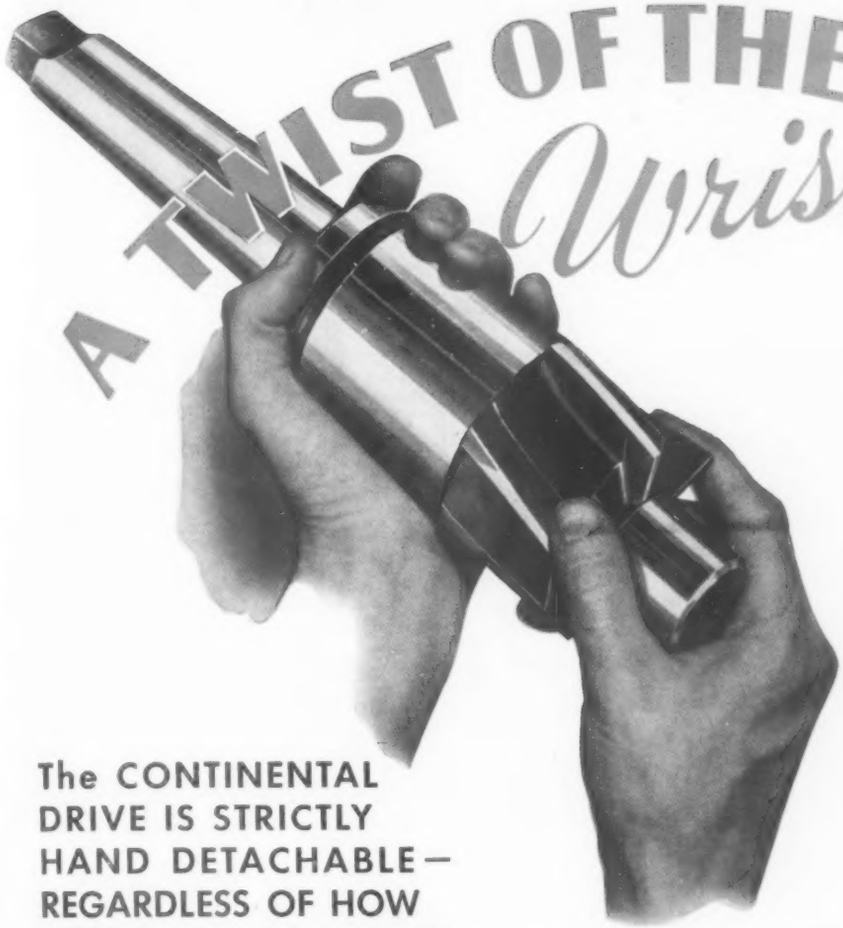
Y

Young Arbor Co. 144
Ralph M. French Advertising

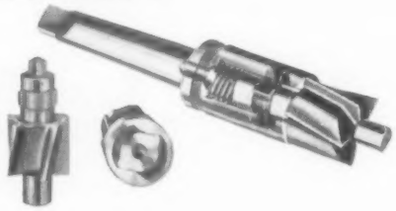
Z

W. M. Ziegler Tool Co. 144
Dudgeon, Taylor & Bruske, Inc.

A TWIST OF THE *Wrist*



The CONTINENTAL DRIVE IS STRICTLY HAND DETACHABLE— REGARDLESS OF HOW SEVERE THE OPERATION HAS BEEN



With an ever-widening range of practical uses, the Continental Counterbore is proving a favorite standard cutting tool in all types and sizes of machine shops. Of rigid and simple construction, with patented features, it has long been outstanding in American industry. There's a reason: Note in illustration at left the Continental indestructible drive. It is composed of two driving lugs formed on the cutter shank, with two corresponding abutments on the inside of the holder. There is an aligning bearing above and below the driving lugs that brings the cutter and holder concentric, and prevents the cutter from being forced out of alignment. The cutter and holder are engaged and disengaged by revolving the cutter a quarter turn *by hand.* No tools or equipment are necessary.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS

CTW

EX-CELL-O CORPORATION

Continental

CUTTING TOOLS

- Boring Bars and Tools
- Broaches
  Broach Pullers
  Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

43-46

Die Designers Specify

HOLO-KROME

fibro forged

INTERNAL SOCKET HEAD **STRIPPER BOLTS** WRENCHING

.....THE BETTER FASTENING METHOD

STRIPPER BOLTS are used to attach the Stripper to the punch in Die Work, and for attaching cams, links, levers and oscillating machine parts. H-K Socket Head Stripper Bolts may be set up tightly in close corners. More turns on the key may be made in restricted working areas. It's the Internal Wrenching!

Heads and bodies are perfectly concentric one with the other and with the threaded portion. Bodies are ground. The threads are perfect in lead and held to Class 3 fit. Scientific head treatment develops the utmost in strength and fatigue resistance.

GUARANTEED UNFAILING PERFORMANCE

SOCKET HEAD STRIPPER BOLT

Your Holo-Krome Industrial Distributor is ready to serve you from his warehouse stock.

THE HOLO-KROME SCREW CORP. HARTFORD, CONN., U. S. A.

...IMIZES PRODUCTION LOSSES!

...production LOSSES means reduc-...duction COSTS. LOSSES usually ...at the machine—stopping such losses ...down costs.

...ng at the Machine" brings the fol-...advantages which contribute to ...ble to sell a product profitably at ...competitive prices:

...ccurate gaging is practiced right at ...duction machine, scrap losses have ...duced as much as 80% and 90%.

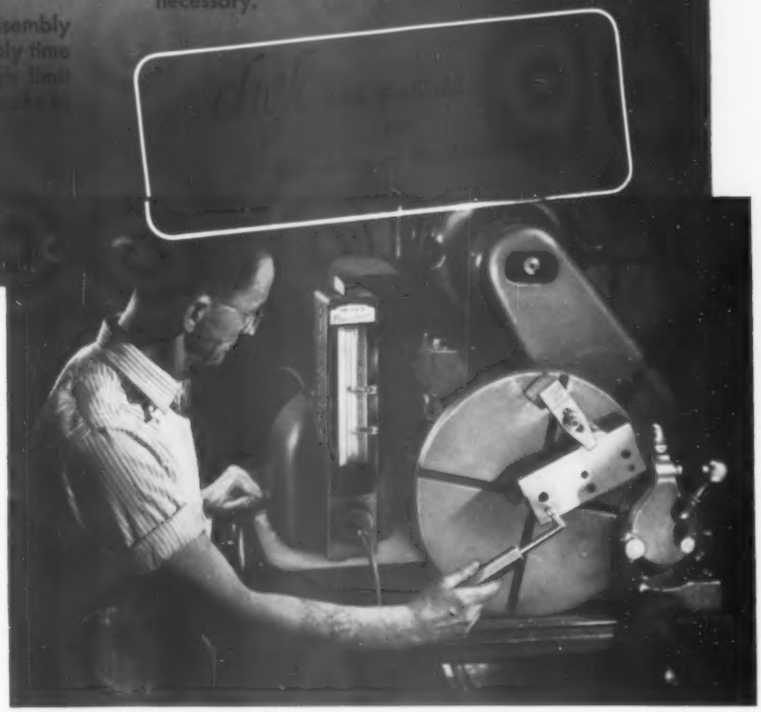
...g at the machine" practically ...salvage work which is nearly

...parts reaching the assembly ...ready—no assembly time ...

4 When high production gaging ... like the Multichek, Precisionaire ... Gage are used at the machine, ... space devoted to inspection ... gage maintenance costs and the ... of inspection are all greatly reduced.

5 Under close dimensional control ... products give maximum ... greater service life, and help build ... for the manufacturer.

6 Fewer parts will wear out in ... then replacement is quickly and ... —no laborious fitting in the ... necessary.

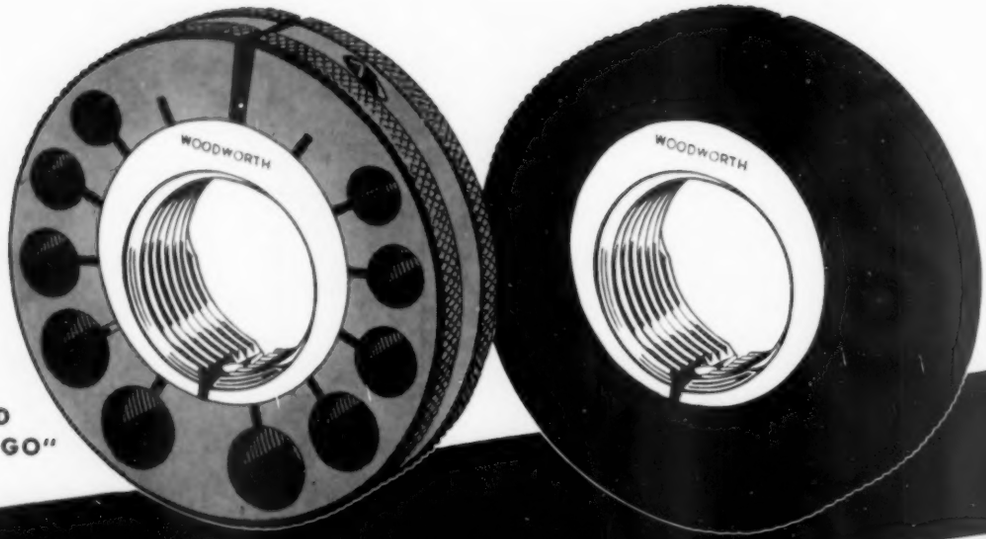


SHEFFIELD MASTER CRAFTSMEN

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U. S. A.

MACHINE TOOLS...GAGES
MEASURING INSTRUMENTS
CONTRACT SERVICES



LONGER GAGE LIFE...
12½ TO 1

5-PLUS FEATURES

1. Greater accuracy and stability
2. Longer wear life
3. Less weight
4. Positive identification
5. Positive adjustment

ACCURACY YOU CAN TRUST

WOODWORTH THREAD RING GAGE PROVES AMAZING SUPERIORITY OVER ORDINARY GAGES

Records for durability . . . for accuracy . . . for economy! They're being established regularly with the new Woodworth Adjustable Thread Ring Gage.

AUTHENTIC SHOP ACCOUNTS TELL OF MAINTAINING ACCURATE INSPECTION AS MUCH AS TWELVE AND ONE-HALF TIMES LONGER THAN ANY OTHER RING GAGE — AND ALL THIS ON EXTRA-TOUGH JOBS. CHECK THIS RECORD AGAINST YOUR EXPERIENCE . . . CONSIDER WHAT IT CAN MEAN IN CUTTING GAGE COSTS!

Then wire or write for our folder No. 46R.

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • PRECISION MACHINE PARTS • DIAPHRAGM CHUCKS • ADJUSTABLE CLAMPING JIGS • SPECIAL TOOLS